

# Final Postflight Hardware Evaluation Report RSRM-32 (STS-57)

November 1993

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Releases

DOC NO. TWR-64240 VOL

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# Thickol CORPORATION SPACE OPERATIONS

## Concurrence by:

Case Design	Johns & Seals Design
Integration Design	Nozzle Design
Igniter / Instrumentation / Electrical Design	Thermal Insulation Design
Quality, Performance Evaluation	Systems Assurance

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## **List of Acronyms**

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<u>Acronym</u>	Definition
CCP	Carbon Cloth Phenolic
CEI	Contract End Item
DR	Discrepancy Report
ECP	Engineering Change Proposal
ET	External Tank
GCP	Glass Cloth Phenolic
ID	Inside Diameter
IFA	In-Flight Anomaly
KSC	Kennedy Space Center
LDI	Low Density Indication
LH	Left Hand
NASA	National Aeronautics and Space Administration
OBR	Outer Boot Ring
OD	Outside Diameter
PEEP	Postflight Engineering Evaluation Plan
PFAR	Postfire Anomaly Record
PFOR	Postfire Observation Record
PR	Problem Report
RH	Right Hand
RSRM	Redesigned Solid Rocket Motor
RTV	Room Temperature Vulcanized (Rubber)
S&A	Safe and Arm Device
SCP	Silica Cloth Phenolic
SII	SRM Ignition Initiator
SPR	Significant Problem Report
STS	Space Transportation System
TWR	Thiokol Wasatch Report

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#### 1.0 INTRODUCTION

This document is the final report for the postflight assessment of the RSRM-32 (STS-57) flight set. This report presents the disassembly evaluations performed at the Thiokol facilities in Utah and is a continuation of the evaluations performed at KSC (TWR-64239).

The PEEP for this assessment is outlined in TWR-50051, Revision B. The PEEP defines the requirements for evaluating RSRM hardware. Special hardware issues pertaining to this flight set requiring additional or modified assessment are outlined in TWR-64237.

All observed hardware conditions were documented on PFORs which are included in Appendix A. Observations were compared against limits defined in the PEEP. Any observation that was categorized as Reportable or had no defined limits was documented on a Preliminary PFAR by the assessment engineers. Preliminary PFARs were reviewed by the Thiokol SPAT Executive Board to determine if elevation to PFARs was required.

#### 2.0 REFERENCES

CPW1-3600A	Prime Equipment Contract End Item Detail Specification, Part I of Two Parts; Performance, Design, and Verification Requirements, Space Shuttle Redesigned Solid Rocket Motor CPW1-3600A For Space Shuttle Solid Rocket Motor Project, Operational Flight Motors (RSRM-4 and subsequent)					
TWA-1993	KSC and Clearfield Photo Log, RSRM-32 (STS-57)					
TWR-50050	KSC Postflight Engineering Evaluation Plan					
TWR-50051	Clearfield Postflight Engineering Evaluation Plan					
TWR-64237	Postflight Hardware Special Issues, RSRM-32 (STS-57), Clearfield					
TWR-64239	KSC Ten-Day Postflight Hardware Evaluation Report, RSRM-(STS-57)					

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#### 3.0 EVALUATION SUMMARY

The engineering evaluation of the RSRM hardware showed that, in general, it performed as expected.

Table I provides a numerical summary of all postflight-related Squawks/Preliminary PFARs, PFARs, IFAs, and SPRs for RSRM-32.

Table I. RSRM-32 Summary					
Squawks/Prelim. PFARs PFARs IFAs SPRs					
KSC Clearfield Total	4 2 6	3 2 5	0 <u>0</u> <b>0</b>	0 <u>0</u> <b>0</b>	

Table II lists all RSRM-32 problems including Squawks and Preliminary PFARs that were not elevated to PFARs.

#### 3.1 CEI Specification Compliance

Based on hardware evaluations, as defined in the KSC and Clearfield PEEPs, all CEI (CPW1-3600A) motor performance requirements were met.

#### 4.0 HARDWARE ASSESSMENT RESULTS

This section outlines the significant observations from the postflight hardware evaluation at Thiokol's Utah facilities. The internal nozzle joints were disassembled on July 7–9, 1993 at the Clearfield H–6 facility. The S&As were disassembled on July 9, 1993 at Final Assembly's M–66A facility. The final factory joint demate occurred on October 25, 1993.

All observations were recorded on PFORs which provide a detailed checklist for hardware conditions. The completed PFORs can be found in Appendix A. Appendices B and C contain the measurements and safety factor data for the nozzle and insulation components, respectively.

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DESCRIPTION	FOREIGN MATERIAL ON IGNITER HEATER POWER CABLE CONNECTOR HEDIUM CORROSION ON AFT DOME TANG SKIRT STUB SCRATCHES ON FIXED HOUSING RADIAL BOLT HOLE SPOTFACE SFAITING	SURFACE SCRATCH & RAISED METAL ON SEALING SURFACE OF FWD FIELD JOINT	ADJUSTABLE VENT PORT PLUG (TOP PLUG) GAS PATHS THROUGH RIV IN JOINT 2 AEC PLY LIFTING IN THE CCP CORROSION/PITTING ON FORMARD DOME FACTORY JOINT TANG SEAL	SURFACE FOREIGN HATERIAL IN IGNITER HEATER POWER CABLE CONNECTOR CORROSION/PITIING ON AFT DOME SKIRT TANG (UNPAINTED REGION) SCRATCH & RAISED HETAL ON SEALING SURFACE OF FORMARD FTEIN	JOINT ADJUSTABLE VENT PORT TOP PLUG GAS PATHS THROUGH RTV IN JOINT 2 AFT EXIT CONE PLY LIFTING IN CCP
SPAT/ RPRB DATE	06/30/93 06/30/93 07/01/93	07/07/93	07/15/93 07/09/93 10/01/93	07/02/93 07/02/93 07/08/93	07/15/93 07/15/93
COMPONENT	JPS/TPS CASE NOZZLE	PORTS/PLUGS	NDZZLE NOZZLE CASE	JPS/TPS CASE Ports/Plugs	NOZZLE NOZZLE
EVALUATION LOCATION	KSC KSC KSC	KSC	H-5/H-7 H-5/H-7 H-5/H-7	KSC KSC KSC	H-5/H-7 OTHER
SPR NUMBER IFA NUMBER	X X X X X X X X X X X X X X X X X X X	N/A	X X X X X X X X X X X X X X X X X X X	X	N/A N/A
SPR NUMBER	N/A N/A A/A	N/A	X X X X X X X X X X X X X X X X X X X	X X X X X X	N/A N/A
ELEVATED FROM	360T032B-01 360T032A-02 N/A	360T032B-03	360T032A-04 360T032B-05 N/A	57-010 57-011 57-017	57C-01 57C-02
TYPE	SQUAMK SQUAMK SQUAMK	SQUAWK	PRELIM. PRELIM. PRELIM.	PFAR PFAR PFAR	PFAR Pfar
PFAR/SQUAWK/ PRELIM. PFAR NUMBER	57-010 57-011 57-013	57-017	57C-01 57C-02 57C-03	36010328-01 3601032A-02 36010328-03	3601032A-04 3601032B-05

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#### 4.1 <u>S&A Devices</u>

(Reference PFORs A-1-to-A-2, A-65-to-A-66)

Both S&A devices were in good condition with no O-ring or seal surface damage observed. There was typical soot on the SII tips at both degree locations (18 and 198) for both S&As. There was typical sooting to the primary O-ring (No. 1) on both rotor shafts. There was additional sooting to the rotor and bore surfaces on the left side. There was also typical erosion and heat affect on the LH BB-to-basket and basket shower cap environmental O-rings.

#### 4.2 Nozzle

(Reference PFORs A-7, A-71)

4.2.1 Nozzle Metal Components – Excluding Joints

All nozzle metal components were in good condition.

- 4.2.2 Nozzle Internal Joints
- 4.2.2.1 Nose Inlet-to-Flexible Bearing-to-Cowl (Joint 2) (Reference PFORs A-8-to-A-12, A-72-to-A-76)

This is the first flight with back filled RTV in Joint 2.

LH

One anomalous condition was observed. Typical scalloped shaped soot was observed to the bolt hole circle intermittently full circumference. Soot reached the primary O-ring at two locations, 108-150 degrees and 306-330 degrees. Both locations corresponded to gas paths through the RTV. Preliminary PFAR 57C-01 was written on this condition. Soot did not go past the O-ring footprint. No O-ring or seal damage was observed. Traces of water were observed in the joint following demate.

The RTV backfill was below the char line over the full circumference to the nose inlet housing aft face. RTV did not reach the primary O-ring. Gas penetration into the joint was observed at 132.5 and 318 degrees. Heat affected paint, CCP and GCP/SCP was observed in the joint. Eroded GCP and adhesive was present at the gas path locations.

Typical corrosion was observed in the joint.

#### RH

The RTV backfill was below the char line over the full circumference to the nose inlet housing aft face. RTV did not reach the primary O-ring. No gas penetration into the joint was observed.

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No O-ring or seal surface damage was observed.

Typical light-to-medium corrosion was observed intermittently full circumference upstream of primary O-ring between bolt holes.

No separations were observed on the cowl assembly or the nose inlet assembly.

4.2.2.2 Nose Inlet-to-Throat (Joint 3)

(Reference PFORs A-13-to-A-17, A-77-to-A-81)

#### LH

The RTV backfill was below the char line over the full circumference. RTV did not reach the primary O-ring. No gas penetration into the joint was observed.

No O-ring or seal surface damage was observed.

Typical light corrosion was observed inboard of the primary O-ring intermittently full circumference.

Typical postburn bondline edge separations were observed on the forward end of the throat assembly. No separations were noted on the nose inlet assembly.

#### RH

The RTV backfill was below the char line over the full circumference. RTV did not reach the primary O-ring. No gas penetration into the joint was observed.

No O-ring or seal surface damage was observed.

Typical light corrosion was observed inboard of the primary O-ring intermittently full circumference.

Typical postburn bondline edge separations were observed on the forward end of the throat assembly. No separations were noted on the nose inlet assembly.

4.2.2.3 Throat-to-Forward Exit Cone (Joint 4)

(Reference PFORs A-18-to-A-22, A-82-to-A-85)

#### LH

The RTV backfill was below the char line over the full circumference. RTV reached the primary O-ring intermittently around the circumference. No gas penetration into the joint was observed.

Light corrosion was observed on the forward exit cone housing secondary seal surface at 0-to-6 and 354 degrees. Medium-to-heavy corrosion observed on throat housing primary seal surface full circumference. This corrosion is splashdown related and is a nominal condition. No O-ring damage was observed.

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Typical postburn bondline edge separations were observed on the throat assembly aft end and the forward exit cone forward end.

#### RH

The RTV backfill was below the char line over the full circumference. RTV reached the primary O-ring intermittently around the circumference. No gas penetration into the joint was observed.

No O-ring or seal surface damage was observed.

Typical postburn bondline edge separations were observed on the throat assembly aft end and the forward exit cone forward end.

No seal or joint anomalies were noted.

4.2.2.4 Aft End Ring-to-Fixed Housing (Joint 5) (Reference PFORs A-23-to-A-28, A-86-to-A-91)

#### LH

The RTV coverage was nominal. The RTV extended forward to the aft end ring/bearing protector interface intermittently around the circumference. The RTV reached the primary O-ring at 290 degrees. Intermittent voids due to the assembly process were noted in the RTV. No gas penetration into the joint was observed.

Light corrosion was observed on the fixed housing sealing surfaces at 110 degrees. Missing paint and corrosion was observed on the aft end ring flange lip at 260 through 265 degrees. Seventy-one of the seventy-two Packings-with-Retainers had typical disassembly damage to the elastomer. No seal surface damage was observed. No O-ring damage was observed.

Typical postburn separations were observed.

#### RH

The RTV coverage was nominal. The RTV extended forward to the aft end ring/bearing protector interface intermittently around the circumference. The RTV reached the primary O-ring from 0-to-70 and 185-to-255 degrees. Intermittent voids due to the assembly process were noted in the RTV. No gas penetration into the joint was observed.

No anomalous conditions were observed. Medium-to-heavy corrosion observed on the aft end ring flange lip full circumference. All seventy-two Packings-with-Retainers had typical disassembly damage to the elastomer. No seal surface damage was observed. No O-ring damage was observed.

Typical postburn separations were observed.

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## 4.2.3 Cowl Insulation Segments

(Reference PFORs A-29, A-92)

The LH and RH cowl insulation segments were in nominal condition and showed typical failure modes at removal.

## 4.2.4 Flexible Bearing Protector, Flexible Bearing, and Flexible Boot (Reference PFORs A-30-to-A-31, A-93-to-A-94)

#### 4.2.4.1 Flexible Bearing Protector

Both flexible bearing protectors were in nominal condition. No burn-through or abnormal heat effects were observed.

#### 4.2.4.2 Flexible Bearing

Both flexible bearings were in good condition. No heat effects were observed.

#### 4.2.4.3 Flexible Boot

The performance of the flexible boots was nominal. The flexible boot remaining plies and margins of safety are summarized in Table III.

Table III. Flexible Boot Performance Margins of Safety

Left Hand Right Ha

		Left Hand			Right Hand		
Degree Location	Remaining Plies	Maximum Affected Depth (in.)	Margin of Safety	Remaining Plies	Maximum Affected Depth (in.)*	Margin of Safety	•
0	3.7	1.17	0.42	3.1	1.37	0.21	
90	3.2	1.34	0.24	3.2	1.34	0.24	
180	3.5	1.24	0.34	3.4	1.27	0.31	
270	3.1	1.37	0.21	3.1	1.37	0.21	

#### 4.2.5 Nozzle Throat Diameter Measurement

(Reference PFORs A-32, A-95)

The average LH nozzle postfire throat diameter was 55.867 inches (erosion rate of 8.23 mils/sec based on an action time of 122.0 sec). The average RH nozzle postfire throat diameter was 55.925 inches (erosion rate of 8.47 mils/sec based on an action time of 121.9 sec). RSRM postfire throat diameters have ranged from 55.787 to 56.072 inches.

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#### 4.2.6 Nozzle Phenolic Bondlines

(Reference PFORs A-33-to-A-39, A-96-to-A-102)

All bondlines were in good condition. Primary, secondary and total bondline failure modes are recorded in Table IV. Typical adhesive voids were observed in all bondlines.

Table IV. Nozzle Phenolic Bondline Failure Mode\* Summary

		letal- dhesi		А	With dhes			Adhesive-to- GCP/SCP		O- Within GCP/SCP			GCP/SCP- to-CCP		Within CCP			
	Р	s	Т	P	S	Т	P	s	Т	P	s	Т	Р	s	Т	Р	S	Т
Aft Exit Cone, LH	13	_	13	_	_	-	_	_	_	87	_	87	-	_	_	_	_	_
Aft Exit Cone, RH	1	_	1	_		_	_	_	_	99	_	99	_	_		_	_	_
Fwd Exit Cone, LH	61	_	61	_		_	39	_	39	_	_	_	_	_	_	_	_	_
Fwd Exit Cone, RH	33	_	33	_	_	_	67	_	67	_	_	_	_	_	_	_	_	
Throat Assembly, LH	100	_	100	_	_	_	_	_	_	-	_	_	_	_	_		_	
Throat Assembly, RH	99.6	_	99.6	_	-	_	0.4	_	0.4	_	_	_	_	_	_	_	_	_
Nose Inlet Rings, LH	90	_	90	_	_	_	10	_	10	_	_	_	_	_	_	_	_	_
Nose inlet Rings, RH	96	_	96	_	_	_	4	_	4	_	_	_	_	_	_	_		_
Nose Cap, LH	_	36	36	_	_		_	64	64	_	_	-	100	_	_	_	_	_
Nose Cap, RH	_	39	39	_	_	_	_	61	61	_	_	_	100	_	_	_	_	_
Cowl, LH	4	_	4		_	_	95.4	_	95.4	0.6	_	_	_	_	_	_	_	_
Cowl, RH	14	_	14	_	_	_	85.5	_	85.5	0.5	_	_	_	_	_	_	_	_
Fixed Housing, LH	_	0.25	0.25		_	_	_	99.75	99.75	100	_	_	_	_	_	_	_	_
Fixed Housing, RH	_	1	1	_	_	_	_	99	99	100	_		_	_		_		

P = Primary

#### 4.2.6.1 Ultrasonic Inspection of Fixed Housing Assemblies

Ultrasonic inspection did not detected any large unbonds on either LH or RH assemblies. Several very small indications were detected. The smaller ultrasonic indications could not be verified during bondline assessment.

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<sup>&#</sup>x27; All failure modes are expressed as percentages of the total bondline.

S = Secondary T = Total



#### 4.2.7 Nozzle Phenolic Sections

(Reference PFORs A-40-to-A-47, A-103-to-A-110)

Char and erosion margins of safety are summarized in Table V. Measurement stations that contain an "N/A" means that data was not available due to missing material. The LH aft exit cone liner was not recovered and therefore is not included. A small portion of the RH aft exit cone was recovered and measurement were taken. All stations showed positive margins of safety. The char and erosion data tables for each component liner can be found in Appendix B. The RH aft exit cone had evidence of ply lifting in the CCP. Preliminary PFAR 57C-02 was written on this condition.

#### 4.3 Leak Check Port Plugs, SIIs, and Ports

(Reference PFORs A-3-to-A-6, A-48-to-A-57; A-67-to-A-70, A-111-to-A-116)

A hair-like fiber was found on the leak check plug shoulder seal (right side (B), 126 degrees). This fiber was photographed and removed for analysis. It was later determined by those present that this fiber was a result of disassembly

No anomalous conditions were observed on any of the internal nozzle joint leak check ports, plugs, or O-rings.

#### 4.4 <u>Case Factory Joints</u>

(Reference PFORs A-58-to-A-64, A-121-to-A-127)

A combination of chemlock and corrosion was present on the sealing surface of the RH forward dome factory joint at 119, 186 and 297 degrees. Upon removal of the corrosion with scotchbrite, pitting was present from one to seven mils in depth. Preliminary PFAR 57C-03 was written on this condition.

All other factory joints were in good condition with no O-ring heat effect or erosion observed.

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Table V. Nozzle Char and Erosion Minimum Margins of Safety Summary

Hardware						Sta	tions	*					
Forward Exit Cone, LH	1 0.30	4 0.26	<b>4.6</b> 0.22	8 0.22	12 0.12	16 N/A	20 N/A	24 N/A	28 0.07	32 0.20	32.9 0.27	34 0.33	
Forward Exit Cone, RH	1 N/A	4 N/A	4.6 N/A	8 N/A	12 N/A	16 N/A	20 N/A	24 N/A	28 N/A	32 N/A	32.9 N/A	34 N/A	
Throat Assembly, LH	1 0.15	2 0.13	<b>4</b> 0.11	6 0.08	8 0.04	10 0.18	12 0.23	14 0.27	16 0.31	18 0.33	<b>20</b> 0.39	22 0.39	<b>23</b> 0.21
Throat Assembly, RH	1 0.13	<b>2</b> 0.11	<b>4</b> 0.11	6 0.07	<b>8</b> 0.04	10 0.11	12 0.20	14 0.24	16 0.28	18 0.37	20 0.42	22 0.38	23 0.22
Nose Inlet Rings, LH	28 0.15	30 0.32	32 0.12	34 0.36	<b>36</b> 0.31	38 0.15	39 0.12						
Nose Inlet Rings, RH	28 0.15	30 0.28	32 0.17	34 0.35	36 0.33	38 0.21	39 0.15						
Nose Cap, LH	1.5 0.64	<b>4</b> 0.59	6 0.67	<b>8</b> 0.65	10 0.68	12 0.72	14 0.68	16 0.63	18 0.51	<b>20</b> 0.44	22 0.12	24 0.02	<b>26</b> 0.06
Nose Cap, RH	1.5 0.54	<b>4</b> 0.50	<b>6</b> 0.84	<b>8</b> 0.79	10 0.88	12 0.88	14 0.77	16 0.76	18 0.52	<b>20</b> 0.42	22 0.12	24 0.01	<b>26</b> 0.08
Cowl/OBR, LH	0.3 0.03	1 0.14	2 0.28	3 0.41	<b>4</b> 0.58	<b>5</b> 0.53	<b>6</b> 0.68	<b>6.8</b> 0.43	8 0.22	9 0.30	10 0.42	11.3 0.37	
Cowl/OBR, RH	<b>0.3</b> 0.06	1 0.13	2 0.19	3 0.39	<b>4</b> 0.49	5 0.60	<b>6</b> 0.59	<b>6.8</b> 0.40	8 0.22	<b>9</b> 0.32	10 0.35	11.3 0.41	
Fixed Housing, LH	<b>0</b> 1.80	1 0.72	2 0.60	3 0.62	4 0.66	5 0.71	<b>6</b> 0.67	7 0.76	8 0.97	9 1.61	10.75 0.62		- 12
Fixed Housing, RH	0 2.43	1 0.84	2 0.69	3 0.62	<b>4</b> 0.78	5 0.71	<b>6</b> 0.74	7 0.83	8 1.00	<b>9</b> 2.37	10.75 0.55		
Aft Exit Cone, LH	84 N/A	90 N/A	96 N/A	102 N/A	108 N/A	114 N/A	119 N/A						
Aft Exit Cone, RH	84 N/A	90 N/A	96 N/A	102 0.15	108 0.03	114 0.26	119 N/A						

<sup>\*</sup> Station locations are shown in bold with the respective margin of safety shown below.

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#### 4.5 Insulation

As specified in the Clearfield PEEP, insulation measurements and inspections were not taken on the RSRM-32 motors internal insulation. Insulation measurements were taken on the LH and RH igniter adapters and can be found in Table 6.

#### 4.5.1 NBR and Castable Inhibitor Debris

No significant NBR or castable inhibitor debris was found during the internal inspection at KSC.

#### 4.5.2 NBR Inhibitor Measurement

All NBR inhibitor thickness measurements were taken and added to the database. The data is summarized in Appendix C.

#### 4.5.3 Igniter Adapter Insulation Measurement

Igniter adapter insulation safety factors are summarized in Tables NO TAGI. All required safety factors were met.

Table VI. Igniter Adapter Insulation Safety Factor Summary

<u>Description</u>	Minimum Compliance Safety <u>Factor</u> *	<u>Station</u>	Degree Location	Minimum Actual Safety <u>Factor</u> *	<u>Station</u>	Degree Location
LH Adapter	3.05	111	150.0	3.65	11	150.0
RH Adapter	3.03	11	270.0	3.62	11	270.0

Minimum required safety factor of 1.5 for the adapter acreage.



#### 5.0 SPECIAL ISSUES SUMMARY

Special postflight hardware issues were identified based on preflight conditions documented in DRs, PRs, ECPs, IFAs, or by anomalous conditions observed in the evaluation of previous flight motors. The following section outlines, by component, the condition and postflight assessment results for the special issues identified on this flight set (reference TWR-64237).

#### 5.1 <u>Insulation</u>

#### 5.1.1 Internal Insulation

1. Condition: The RH nozzle-to-case joint flap thickness on the aft segment was

identified to be below the minimum requirement intermittently over the full

circumference. No repair was made on this condition.

Reference: DR 409141-01

Results: The Clearfield planning failed to include the action for this special issue and

the RH aft segment was rinsed out prior to a sample of the joint flap being

removed. No results were obtained.

#### 5.1.2 Igniter Insulation

There are no Clearfield Special Issues for the igniter insulation component on this flight set.

#### 5.2 <u>Case, Seals, and Joints</u>

#### 5.2.1 Case

1. Condition: During splashdown/recovery, debris strikes the case segment interior

insulation. Impacts have been observed to cut through the insulation to the case exposing bare metal. This results in corrosive pitting on the case ID at these impact regions. This is suspected to be tied into "spider pitting."

Reference: PFAR 360T030B-10

Results: This evaluation was not performed. The "spider pitting" team determined

that the information would not meet the report deadline and therefore

canceled the request for the data.

#### 5.2.2 Seals

There are no Clearfield Special Issues for the Seals component on this flight set.

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#### 5.2.3 **Joints**

There are no Clearfield Special Issues for the Joints component on this flight set.

#### 5.3 Nozzle

#### 1. Condition:

The LH Joint 4 primary O-ring groove in the GCP exceeds the depth requirements by 0.008 inch at 90 and 270 degrees.

**Reference:** DR 413107–01

Results: No abnormal conditions observed in the Joint 4 O-ring groove. Performance was nominal with the deeper groove at 90 and 270 degrees.

2. Condition: The LH inner boot ring has wetline indications on the forward end at 2-to-9.5, 13-to-16, 323-to-327 and 333-to-337 degrees. These indications are approximately 0.05 inch outboard of the bondline.

**Reference:** DR 410998-01

Results: There was no sign of growth in the wetline areas.

3. Condition: Part of the improvement to the Joint 2 assembly method is the complete

bonding of the cowl segments to the cowl housing and cowl SCP.

Reference: ECP SRM-2756, STS-57 FRRT, page 91

Results: No unbonds or anomalous conditions were observed on either LH or RH

cowl segments.

4. Condition: Part of the improvement to the Joint 2 assembly method is the changing from the "butter" application of the RTV to the backfill method of applying

the RTV.

Reference: ECP SRM-2756, STS-57 FRRT, page 91

Results: The RTV backfill reached the nose inlet aft end surface on both LH and RH joints. Two gas paths were observed in the LH joint. One gas path was located 318 degrees. Soot entered the joint and extended to the primary O-ring at 306-to-330 degrees. Charred CCP, GCP and SCP were observed below the char line. Eroded GCP was observed with a maximum depth of 0.003 inch. Heat affected paint was present on forward end ring flange OD. The gas path at 132 was located at a RTV repair and is discussed in Special

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Issue 5. Intermittent encapsulated voids with maximum diameter of 0.10 inch were present in the LH joint.

One large encapsulated void was present in the RH joint. The void measured 0.39 inch circumferential by 0.775 inch radial and was located at 354 degrees. This void was located at a RTV repair location. The repair depth was great enough to assure that the RTV was below the char line at this location.

5. Condition: LDI present in the LH Joint 2 RTV located at 133.5 degrees and measuring 0.150 inch circumferentially by 1.625 inches radially. It was repaired by injecting RTV into it.

**Reference:** DR 410545-02

Results: A gas path was observed at 132 degrees at the RTV repair. Soot entered the joint and extended to the primary O-ring at 108-to-150 degrees. Charred CCP, GCP and SCP were observed below the char line. Eroded GCP was observed with a maximum depth of 0.006 inch. Heat affected paint was present on forward end ring flange OD. This was the fist joint to have a RTV repair.

**6. Condition:** The RH bearing protector has nine voids that were repaired by filling the voids with silicone paste compound per process finalization procedures.

Reference: Insulation Work Center

**Results:** No abnormal conditions observed at the repair locations.

7. Condition: Nozzle Work Center Design Engineering (NWCDE) is gathering data relating to the correlation of bondline voids and LDIs. Evaluation of the cowl, nose cap and forward nose ring is needed for both the LH and RH nozzles.

Reference: Nozzle Work Center

Results: Nine adhesive voids were documented on the LH forward nose ring-to-nose inlet housing bondline. Five adhesive voids were documented on the LH nose cap-to-nose inlet housing bondline. No pit repair locations were documented on the LH nose inlet bondlines. No adhesive voids or pit repair locations were documented on the LH cowl bondlines.

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Two adhesive voids were documented on the RH forward nose ring-to-nose inlet housing bondline. Four adhesive voids were documented on the RH nose cap-to-nose inlet housing bondline. No pit repair locations were documented on the RH nose inlet bondlines. No adhesive voids or pit repair locations were documented on the RH cowl bondlines.

**8. Condition:** LDIs in LH nose cap-to-forward nose ring interface at 19, 20, 27, 48, 131, 132, 149, 150, 157, 283, 299, 306 and 314 degrees.

**Reference:** DRs 410535-01 and 410545-01

**Results:** Adhesive voids were documented near the LDI locations at 27, 48, 131, 132, 149, 157, 283, 299 and 306 degrees. No indications of the LDIs were found at 19, 20, 150 and 314 degrees.

9. Condition: LDIs in the nose cap-to-nose inlet housing bondline at 1, 16, 33, 79, 163, 177 and 316 degrees.

**Reference:** DRs 410535-02 and 410545-03

Results: Adhesive voids were documented near the LDI locations at 1, 163, 177, and 316 degrees. No indications of the LDIs were found at 16, 33, and 79 degrees.

10. Condition: LDIs in the LH forward nose ring-to-nose inlet housing bondline. The two worst cases are located at 110 and 290 degrees on the forward end of the nose inlet housing.

**Reference:** DR 410535-03

**Results:** No indications of the LDIs were found. X-Ray assessment of the forward nose ring sections for LDIs was not performed.

11. Condition: LDIs in the RH nose cap-to-nose inlet housing bondline at 32, 128, 145, 212 and 245 degrees.

**Reference:** DRs 410536–01 and 413901–01

Results: Adhesive voids were documented near the LDI locations at 1, 163, 177 and 316 degrees. No indications of the LDIs were found at 16, 33 and 79 degrees.

12. Condition: LDIs in the RH nose cap-to-forward nose ring interface at 182 degrees.

**Reference:** DRs 410536-02 and 413901-03

Results: No indications of the LDI was found.

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13. Condition: Part of the improvement to the Joint 2 assembly method is bonding of the cowl housing and the cowl SCP before joint assembly.

Reference: ECP SRM-2756, STS-57 FRRT, page 91

Results: The amount of metal-to-adhesive separation was much lower than previous cowl bondlines (typically 100 percent metal-to-adhesive). The metal-to-adhesive separations were 4 percent and 14 percent for the LH and RH, respectively.

14. Condition: LDIs in the RH aft exit cone GCP from 270-to-277 degrees and approximately 37.0 inches from the forward end. The LDI measures 4.0 inches axially by 7.97 inches circumferentially.

**Reference:** DR 410567-01

Results: This Special Issues was written for the aft exit cone assembly originally assigned to this flight. There was switch-out of the RH aft exit cone assembly. The original assembly was returned to Thiokol. This Special Issue will be performed when this assembly is flown. The aft exit cone assembly with DR 410567 is scheduled to flight on RSRM-38B.

15. Condition: The LH aft exit cone assembly experienced an out-of-family temperature condition of 111 degrees during in-plant transportation.

Reference: TWR-64976, S&MA Preflight Assessment, page 63

**Results:** No abnormal bondline separation modes observed.

**16. Condition:** The LH forward exit cone assembly experienced an out-of-family bondline shim-to-coeflex differential (i.e. bondline thickness smaller than the shim).

Reference: TWR-64976, S&MA Preflight Assessment, page 66

Results: The bondline separation was typical of past forward exit cones. The bondline separated 61 percent metal-to-adhesive and 39 percent adhesive-to-GCP.

The shims appeared to uniform in thickness and were measured in on location. The adjacent adhesive thickness was also measured.

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Table VII. FEC Bondline Adhesive Thickness

Degree	Bondline Location of Shim	Shim Thickness	Adjacent Adhesive Thickness
0	fwd	0.063	0.063
0	aft	0.065	0060
45	fwd	0.064	0.074
45	aft	0.065	0.062
90	fwd	0.062	0.061
90	aft	0.062	0.063
135	fwd	0.064	0.075
135	aft	0.063	N/A
180	fwd	0.062	0.061
180	aft	0.065	0.062
225	fwd	0.063	0.069
225	aft	0.065	0.0.65
270	fwd	0.063	0.0.60
270	aft	0.062	0.066

17. Condition: The cowl ply angle has been changed from 0 degrees to -50 degrees on both the LH and RH cowls.

Reference: ECP SRM-2674, STS-57 FRRT, page 94

Results: Erosion and char measurements were completed and are comparable to the -50 degree ply angle full RSRM static test cowl measurements (FSM-02 and

FSM-03). All margin of safety calculations were positive.

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Table VIII. Cowl Char and Erosion Measurements

		RSRN	1-32A	RSRN	И-32B	FSN	1-02	FSM	1-03
Station	,	Max	Min	Max	Min	Max	Min	Max	Min
0.3	Erosion	0.31	0.28	0.29	0.24	0.37	0.23	0.35	0.23
. 0.5	Char	0.72	0.78	0.73	0.73	0.63	0.67	0.61	0.67
1.0	Erosion	0.32	0.26	0.30	0.23	0.35	0.22	0.35	0.22
1.0	Char	0.66	0.70	0.73	0.71	0.57	0.62	0.60	0.62
2.0	Erosion	0.27	0.22	0.30	0.24	0.26	0.16	0.36	0.16
2.0	Char	0.69	0.67	0.72	0.72	0.58	0.67	0.57	0.67
3.0	Erosion	0.26	0.20	0.25	0.21	0.27	0.14	0.33	0.14
3.0	Char	0.65	0.66	0.65	0.76	0.60	0.69	0.58	0.69
4.0	Erosion	0.24	0.18	0.24	0.20	0.24	0.13	0.30	0.13
4.0	Char	0.62	0.72	0.68	0.75	0.61	0.69	0.64	0.69
5.0	Erosion	0.20	0.18	0.19	0.17	0.23	0.11	0.23	0.11
5.0	Char	0.78	0.69	0.73	0.77	0.62	0.72	0.67	0.72
6.0	Erosion	0.16	0.14	0.17	0.15	0.21	0.13	0.20	0.13
6.0	Char	0.70	0.76	0.69	0.80	0.59	0.75	0.82	0.75
6.8	Erosion	0.25	0.15	0.20	0.12	NA	NA	NA	NA
0.8	Char	0.82	0.87	0.91	0.84	NA	NA	NA	NA

18. Condition: The RH aft exit cone is the first component to fly with NARC CCP.

Reference: ECP SRM-1999R2, STS-57 FRRT, page 97

Results: The remaining sections of CCP attached to the housing were measured. Ply lifting was observed the full circumference and axial length of the recovered CCP. All margins of safety calculations were positive. The ply lifted region was included in the char measurements. The ply lift investigation is summarized in TWR-65606, "HPM/RSRM Aft Exit Cone Ply Lift Summary".

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## Thickol CORPORATION

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19. Condition: The LH aft exit cone CCP has high interlaminer double shear strength. This CCP material was dispositioned "limited use" after this AEC was manufactured. The LH AEC was then stored until the TEM-09 AEC with similar material properties was fired and performed nominally. This AEC was then dispositioned "use as is".

**Reference:** DRs 402834-01 and 409214-01

Results: Several sections of CCP were recovered from the inside of the LH motor. Sections were shipped to the Clearfield facility. The sections were misplaced at Clearfield and the assessment cannot be completed.



# Appendix A Postflight Observation Records (PFORs)

# Final Postflight Hardware Evaluation Report RSRM-32 (STS-57)

November 1993

#### Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.

NAS8-38100

DR No.

4-23

WBS No.

4C601-04-01

ECS No.

SS4775



P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511



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### REQUIRED PFOR LIST

PFOR	<u>Side</u>	Final Ten-Day Report Page <u>Number</u>
S&A Device (Barrier-Booster and Environmental Seal Regions)	LH	A-1
S&A Rotor Shaft O-rings (Detailed)	LH	A-2
SII and Port (At Removal) - 18 Degrees	LH	A-3
SII and O-rings (Detailed) - 18 Degrees	LH	A-4
SII and Port (At Removal) - 198 Degrees	LH	A-5
SII and O-rings (Detailed) - 198 Degrees	LH	A-6
Nozzle Metal Components - Excluding Joints	LH	<b>A-</b> 7
Nozzle Internal Joint 2 (Nose Inlet-to-Flex Bearing-to-Cowl)	•	
Nozzle Internal Joint RTV - Joint 2	LH	A-8
Nozzle Internal Joint Phenolics - Joint 2	LH	A-9
Nozzle Internal Joint Seals and Metal - Joint 2	LH	A-10
Nozzle Internal Joint Drawing Worksheet - Joint 2	LH	A-11
Nozzle Internal Joint O-rings (Detailed) - Joint 2	LH	A-12
Nozzle Internal Joint 3 (Nose Inlet-to-Throat)		
Nozzle Internal Joint RTV - Joint 3	LH	A-13
Nozzle Internal Joint Phenolics - Joint 3	LH	A-14
Nozzle Internal Joint Seals and Metal - Joint 3	LH	A-15
Nozzle Internal Joint Drawing Worksheet - Joint 3	LH	A-16
Nozzle Internal Joint O-rings (Detailed) - Joint 3	LH	A-17
Nozzle Internal Joint 4 (Throat-to-Forward Exit Cone)		
Nozzle Internal Joint RTV - Joint 4	LH	A-18
Nozzle Internal Joint Phenolics - Joint 4	LH	A-19
Nozzle Internal Joint Seals and Metal - Joint 4	LH	A-20
Nozzle Internal Joint Drawing Worksheet - Joint 4	LH	A-21
Nozzle Internal Joint O-rings (Detailed) - Joint 4	LH	A-22

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## RE SED PFOR LIST (Co t.)

<u>PFOR</u>	<u>Side</u>	Final Ten-Day Report Page <u>Number</u>
Nozzle Internal Joint 5 (Aft End Ring-to-Fixed Housing)		
Nozzle Internal Joint RTV - Joint 5	LH	A-23
Nozzle Internal Joint Phenolics - Joint 5	LH	A-24
Nozzle Internal Joint Seals and Metal - Joint 5	LH	A-25
Nozzle Internal Joint Drawing Worksheet - Joint 5	LH	A-26
Nozzle Internal Joint O-rings (Detailed) - Joint :	LH	A-27
Nozzle Internal Joint Packings With Retainers (Detailed) - Joint 5	LH	A-28
Cowl Insulation Segments	LH	A-29
Flexible Bearing Protector, Flexible Bearing, and Flexible Boot	LH	A-30
Flexible Bearing Protector Measurements	LH	A-31
Nozzle Throat Diameter Measurements	LH	A-32
Nozzle Phenolic Bondlines		
Nozzle Phenolic Bondline - Aft Exit Cone Assembly	LH	A-33
Nozzle Phenolic Bondline - Forward Exit Cone Assembly	LH	A-34
Nozzle Phenolic Bondline - Throat Assembly	LH	A-35
Nozzle Phenolic Bondline - Forward Nose and Aft Inlet Rings	LH	A-36
Nozzle Phenolic Bondline - Nose Cap	LH	A-37
Nozzle Phenolic Bondline - Cowl Assembly	LH	A-38
Nozzle Phenolic Bondline - Fixed Housing Asse nbly	LH	A-39

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Nozzle Phenolic Sections		
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Nozzle Phenolic Sections - Forward Exit Cone	LH	A-41
Nozzle Phenolic Sections - Throat Assembly	LH	A-42
Nozzle Phenolic Sections - Forward Nose and Aft Inlet Lings	LH	A-43
Nozzle Phenolic Sections - Nose Cap	LH	A-44
Nozzle Phenolic Sections - Cowl	LH	A-45
Nozzle Prenolic Sections - Fixed Housing	LH	A-46
Nozzle Phenolic Sections - Outer Boot Ring and Flexible E oot	LH	A-47
Leak Check Po t Plugs and Ports		
Barrier-Boster Leak Check Port Plug and Port (At Remo al) – 126 Degrees	LH	A-48
Barrier-Boster Leak Check Port Plug and O-ring (Detailed) - 126 Degrees	LH	A-49
Nozzle In ernal Joint Leak Check Port Plug and Port (At Remo al) - Joint 2	LH	A-50
Nozzle In ernal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 2	LH	A-51
Nozzle In ernal Joint Leak Check Port Plug and Port (At Removal) - Joint 3	LH	A-52
Nozzle In ernal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 3	LH	A-53

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<u>PFOR</u>	<u> </u>	Re	Final Ten-Day port Page <u>Number</u>
Leak Check Port Plugs and Ports (Cont.)			
Nozzle Internal Joint Leak Check Port Plug and (At Removal) - Joint 4	Port	LH	A-54
Nozzle Internal Joint Leak Check Port Plug and (Detailed) - Joint 4	O-ring	LH	A-55
Nozzle Internal Joint Leak Check Port Plug and (At Removal) - Joint 5	Port	LH	A-56
Nozzle Internal Joint Leak Check Port Plug and (Detailed) - Joint 5	O-ring	LH	A-57
Case Factory Joints			
Case Factory Joint - Forward Dome		LH	A-58
Case Factory Joint - Forward Cylinder/Cylinder		LH	A-59
Case Factory Joint - Forward Center		LH	A-60
Case Factory Joint - Aft Center		LH	A-61
Case Factory Joint - ET Attach/Stiffener		LH	A-62
Case Factory Joint - Stiffener/Stiffener		LH	A-63
Case Factory Joint - Aft Dome		LH	A-64
S&A Device (Barrier-Booster and Environmental Seal	Regions)	RH	A-65
S&A Rotor Shaft O-rings (Detailed)		RH	A-66
SII and Port (At Removal) - 18 Degrees		RH	A-67
SII and O-rings (Detailed) - 18 Degrees		RH	A-68
SII and Port (At Removal) - 198 Degrees		RH	A-69
SII and O-rings (Detailed) - 198 Degrees		RH	A-70
Nozzle Metal Components - Excluding Joints		RH	A-71
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Nozzle Internal Joint 2 (Nose Inlet-to-Flex Bearing-to-Cowl)		
Nozzle Internal Joint RTV - Joint 2	RH	A-72
Nozzle Internal Joint Phenolics - Joint 2	RH	A-73
Nozzle Internal Joint Seals and Metal - Joint 2	RH	A-74
Nozzle Internal Joint Drawing Worksheet - Joint 2	RH	A-75
Nozzle Internal Joint O-rings (Detailed) - Joint 2	RH	A-76
Nozzle Internal Joint 3 (Nose Inlet-to-Throat)		
Nozzle Internal Joint RTV - Joint 3	RH	A-77
Nozzle Internal Joint Phenolics - Joint 3	RH	A-78
Nozzle Internal Joint Seals and Metal - Joint 3	RH	A-79
Nozzle Internal Joint Drawing Worksheet - Joint 3	RH	A-80
Nozzle Internal Joint O-rings (Detailed) - Joint 3	RH	A-81
Nozzle Internal Joint 4 (Throat-to-Forward Exit Cone)		
Nozzle Internal Joint Phenolics - Joint 4	RH	A-82
Nozzle Internal Joint Seals and Metal - Joint 4	RH	A-83
Nozzle Internal Joint Drawing Worksheet - Joint 4	RH	A-84
Nozzle Internal Joint O-rings (Detailed) - Joint 4	RH	A-85
Nozzle Internal Joint 5 (Aft End Ring-to-Fixed Housing)		
Nozzle Internal Joint RTV - Joint 5	RH	A-86
Nozzle Internal Joint Phenolics - Joint 5	RH	A-87
Nozzle Internal Joint Seals and Metal - Joint 5	RH	A-88
Nozzle Internal Joint Drawing Worksheet - Joint 5	RH	A-89
Nozzle Internal Joint O-rings (Detailed) - Joint 5	RH	<b>A-9</b> 0
Nozzle Internal Joint Packings With Retainers (Detailed) - Joint 5	RH	A-91
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## REQUIRED PFOR LIST (Cont.)

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Cowl Insulation Segments	RH	A-92
Flexible Bearing Protector, Flexible Bearing, and Flexible Boot	RH	A-93
Flexible Bearing Protector Measurements	RH	A-94
Nozzle Throat Diameter Measurements	RH	A-95
Nozzle Phenolic Bondlines	,	
Nozzle Phenolic Bondline - Aft Exit Cone Assembly	RH	A-96
Nozzle Phenolic Bondline - Forward Exit Cone Assembly	RH	A-97
Nozzle Phenolic Bondline - Throat Assembly	RH	A-98
Nozzle Phenolic Bondline - Forward Nose and Aft Inlet Rings	RH	A-99
Nozzle Phenolic Bondline - Nose Cap	RH	A-100
Nozzle Phenolic Bondline - Cowl Assembly	RH	A-101
Nozzle Phenolic Bondline - Fixed Housing Assembly	RH	A-102
Nozzle Phenolic Sections		
Nozzle Phenolic Sections - Aft Exit Cone	RH	A-103
Nozzle Phenolic Sections - Forward Exit Cone	RH	A-104
Nozzle Phenolic Sections - Throat Assembly	RH	A-105
Nozzle Phenolic Sections - Forward Nose and Aft Inlet Rings	RH	A-106
Nozzle Phenolic Sections - Nose Cap	RH	A-107
Nozzle Phenolic Sections - Cowl	RH	A-108
Nozzle Phenolic Sections - Fixed Housing	RH	A-109
Nozzle Phenolic Sections - Outer Boot Ring and Flexible Boot	RH	A-110



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Leak Check Port Plugs and Ports		
Barrier-Booster Leak Check Port Plug and Port (At Removal) - 126 Degrees	RH	A-111
Barrier-Booster Leak Check Port Plug and O-ring (Detailed) - 126 Degrees	RH	A-112
Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 2	RH	A-113
Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 2	RH	A-114
Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 3	RH	A-115
Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 3	RH	A-116
Leak Check Port Plugs and Ports (Cont.)		
Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 4	RH	A-117
Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 4	RH	A-118
Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 5	RH	A-119
Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 5	RH	A-120

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## REQUIRED PFOR LIST

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Case Factory Joints		
Case Factory Joint - Forward Dome	RH	A-121
Case Factory Joint - Forward Cylinder/Cylinder	RH	A-122
Case Factory Joint - Forward Center	RH	A-123
Case Factory Joint - Aft Center	RH	A-124
Case Factory Joint - ET Attach/Stiffener	RH	A-125
Case Factory Joint - Stiffener/Stiffener	RH	A-126
Case Factory Joint - Aft Dome	RH	Δ_127



## POSTFLIGHT OBSERVATION RECORD (PFOR) S&A Device (Barrier-Booster and Environmental Seal Regions)

Motor No.: RSRM-32 Side: Left	(A) Date: 7-9-93
Assessment Engineer(s)/Inspector(s): 5.	den M. Nolan M. Lyon L. Mulauley
Barrier-Booster Bore and Rotor:  a. Soot to or past O-rings? b. Sooted metal surfaces? c. Heat affected or eroded O-ring (installed) d. O-ring damage (installed)?	Yes No Comment #
e. Foreign material?	
f. Heat affected or eroded metal?	
g. Metal damage? h. Excessive grease?	
i. Corrosion?	
j. Teflon retainer damage?	
Environmental Seal Regions:	,
k. Environmental O-ring assembly damage	
(visible without magnification)?	
I. Foreign material?	
Notes / Comments	
1- Typical soot to primary O-ri	ing (#1) and rotor and bore surfaces.
Note: Slight heat affect and eros basket shower cap environm	tion on both the B-B-to-basket and sental O-rings. (Typical condition)
Preliminary PFAR(s)?YesNo	Preliminary PFAR Number(s):
Clarification Form(s)? Yes No	Number of Forms Attached:
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## POSTFLIGHT OBSERVATION RECORD (PFOR) S&A Rotor Shaft O-rings (Detailed)

Motor No.: RSRM-32	Side: Left (A)	Date: 7-9-93	3
Assessment Engineer(s)/Inspector	(s): S. Eden, M. Ly	on, C. Taylor, L. Macc	auley
Forward Primary O-ring: #2  a. Heat affected or eroded O-b. O-ring defects/damage?	ring?	Yes No	Comment #
Aft Primary O-ring: #/ c. Heat affected or eroded O- d. O-ring defects/damage?	-ring?		
Forward Secondary O-ring: #4  e. Heat affected or eroded O-  f. O-ring defects/damage?	-ring?		
Aft Secondary O-ring: #3 g. Heat affected or eroded O- h. O-ring defects/damage?	-ring?		
Notes / Comments			
		•	
Preliminary PFAR(s)? Yes		nary PFAR Number(s):	
Clarification Form(s)? Yes	s <u>V</u> No Numbe	r of Forms Attached:	***
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SII and Port (At Removal) - 18 Degrees

Motor No.: RSRM-32 Side: Left (A)	Date: 7-9-93
Assessment Engineer(s)/Inspector(s): 5. Eden,	M. Lyon, C. Taylor, L. MacCouley
sil and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-ring (installed)? d. O-ring damage (installed)? e. Eroded metal? f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion? i. Metal damage?	Yes No Comment #
Notes / Comments	
1- Typical soot to tip of SI	
Preliminary PFAR(s)? Yes No	Preliminary PFAR Number(s):
Clarification Form(s)? YesNo	Number of Forms Attached:
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SII and O-rings (Detailed) - 18 Degrees

Motor No.: RSRM-32 Side:	Left (A)		Date: /- 9 - 7.	<del></del>
Assessment Engineer(s)/Inspector(s): 5	. Eden, M. Lyo.	n, C. Taylor,	L. Mac Caule	24
Sil:  a. Foreign material between the O-riub. Eroded metal?  c. Seal surface/thread damage?	ng and SII?	Ye	No V	Comment #
Primary O-ring:  d. Heat affected or eroded O-ring?  e. O-ring defects/damage?				
Secondary O-ring:  f. Heat affected or eroded O-ring? g. O-ring defects/damage?				
Notes / Comments				
			•	
[ - -				
Preliminary PFAR(s)? Yes	No Prelim	ninary PFAR Nui	mber(s):	
Clarification Form(s)? Yes	✓ No Numb	er of Forms Att	ached:	<del>-</del>
REVISION		DOC NO. TV	VR-64240 VOL	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Sil and Port (At Removal) - 198 Degrees

Motor No.: RSRM-32 Side: Left (A)	Date: 7-9-93
Assessment Engineer(s)/Inspector(s): S. Eden, M. Lyon,	, C. Taylor, L. MacCauley
a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-ring (installed)? d. O-ring damage (installed)? e. Eroded metal? f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion? l. Metal damage?	Yes No Comment #
Notes / Comments	
1- Typical soot to tip of SII.	
	inary PFAR Number(s):er of Forms Attached:
REVISION	DOC NO. TWR-64240 VOL SEC PAGE A-5



# POSTFLIGHT OBSERVATION RECORD (PFOR) SII and O-rings (Detailed) - 198 Degrees

Motor No.: RSRM-32	Side: Left (A)	Date: 7-9-93
Assessment Engineer(s)/Inspector	(s): 5. Eden, M. Lyon, C.	Taylor, L. MacCauley
SII:  a. Foreign material between to b. Eroded metal? c. Seal surface/thread damage	he O-ring and SII?	Yes No Comment #
Primary O-ring:  d. Heat affected or eroded O- e. O-ring defects/damage?	ring?	
Secondary O-ring:  f. Heat affected or eroded O- g. O-ring defects/damage?	ring?	
Notes / Comments		
Preliminary PFAR(s)? Yes	sNo Preliminary PFA	AR Number(s):
Clarification Form(s)?Yes	No Number of For	ms Attached:
REVISION	DOC NO.	TWR-64240 VOL PAGE A-6



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Metal Components - Excluding Joints

Motor No.: RSRM-32 Side: Left (A)	Date: 9 July 93
Assessment Engineer(s)/Inspector(s): J. Passman, R	
Metal Component (check appropriate space when evaluation is	completed):
Forward Exit Cone Housing	Flexible Bearing
Fixed Housing	<u>√</u> Throat Housing
Cowl Housing	Nose Inlet Housing
Metal Components:  a. Metal damage?	Yes No Comment #
b. Loose or missing fasteners?	<u> </u>
(including forward exit cone forward shear pins)	
c. Heat affected paint (discolored and blistered)?	
d. Bubbled paint?	
e. Missing primer or paint not due to impact or handling?	
f. Heavy corrosion?	<u> </u>
Notes / Comments	
Preliminary PFAR(s)? Yes No Prelimina	ary PFAR Number(s):
Clarification Form(s)? Yes No Number	of Forms Attached:
REVISION _	DOC NO. TWR-64240 VOL  PAGE A-7

REVISION \_\_\_\_

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Internal Joint RTV - Joint 2

	Nozzie internai Joint Ni v - Jo	om 2
Motor No.: RSRM-32	Side: Left (A)	Date: 9 July 93
Assessment Engineer(s)/Inspector(s	B): Jim Passman, TREVOR	R FRESTON, WANNE SPERRY
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backfif. Foreign material?	ill?	Yes No Comment # (1) (1)
BACKFILL WAS IN GOOD BONDLINE FULL OF  (1) GAS PATHS THROUG  REACHED FRIMARY C	TO PIEACH PRIMARY OF CONDITION, RTV REACHED RT 13 PRING AT 1082/50°, RT WAS ALSO PRESENT A LOW FOR DIMENSIONS. A REPROX. MEASUREMENTS ARE	BUND THROUGH THE BACKFILLED OF RING. OVERALL THE JOINT ON NOSE INLET HOUSING FULL CIRC AND 32.5° AND 318°, SONT AND 306° 330°, HEAT AFFECTED AT GAS PATH LOCATIONS. EROSION TO THE GCP OCURRED AT E SHOWN BELOW.
NOSE INLT GEP 0.150  DEPTH TO GEP  FUND END  RING FLANSE  CHAMPER  CHAMPER	NOSE JUNES HOUSING HOUSING FUD EUD FUN E DA  CHARE RONNE RONNING MATCRIAL Preliminary PI	100 Housing
Ciarification Porm(s)? Yes	No Number of Fo	

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

	Nozzie Internal	Joint Phenolics – Jo	oint 2		
Motor No.: RSRM-32	Side: Left (A	<b>(</b> )	Date:	9 July	93
Assessment Engineer(s)/Inspector(s	i): Jim Pass	MAN, TREVOR F	RESTON,	WAYNE	Speecy
Joint Phenolics:  a. Heat affected or eroded CCI or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive-GCP/SCP, within Gor within CCP)?  d. Phenolics axially displaced for	P (below the chand	ar line), GCP/SCP, adhesive, CP-to-CCP,	Yes	No V	Comment # ( 2 )
Notes / Comments  (1) RTV COUERED BE WHERE RTV WAS FOUND ON COWL BOND  (2) HEAT AFFECTED SCT PATHS AT 132.55 ON THE GCP, SC ARE Shown IN	Removed Soline.  P. CCP AND AND 318 PAND CCP.	Showed NO E GCP IN C B. Slight E Approx D	ine w Leosion	ith Gas Nas evi	edge Seps. Sent
HOUSING  EAGUE  ADHESIUM  CCP  CHAR TIME  REMAINING MATERIAL  REMAINING MATERIAL	RTU	OHESIVE WAS ERO GAS PATH loca	DED IN TH	is location Down to	N GCP.
Preliminary PFAR(s)? Yes	No	Preliminary PFAF			01
Clarification Form(s)?Yes	No	Number of Form	s Attached		
REVISION		DOC NO.	TWR-64	240 VOL	

**Thickol** CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Internal Joint Seals and Metal - Joint 2

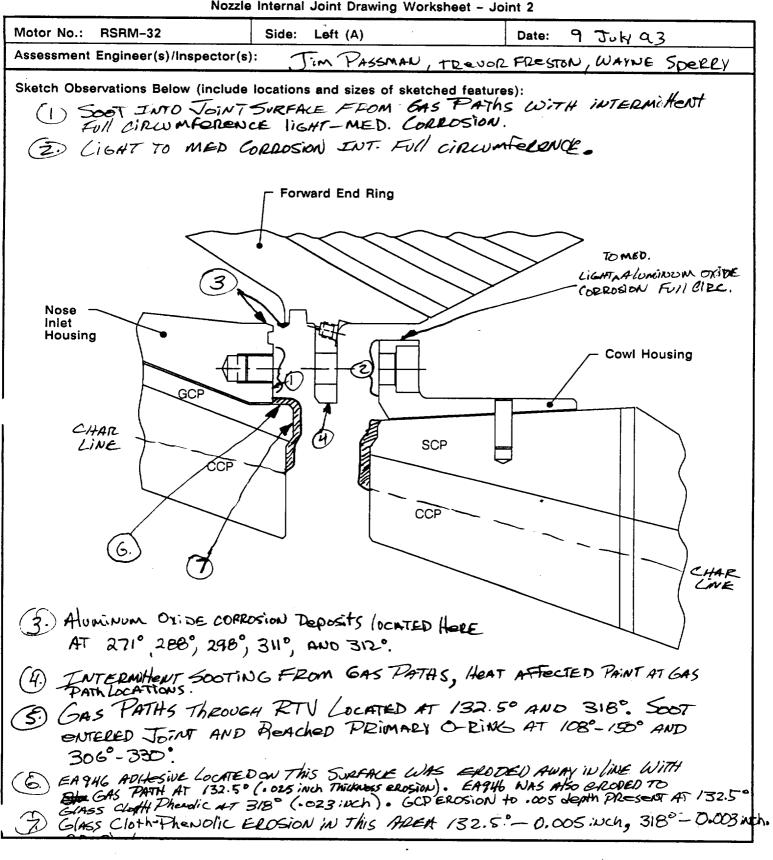
Motor No.: RSRM-32	Side: Left (A)	Date:	7-9-83
Assessment Engineer(s)/Inspector(s	s): W. Speny M.	Offoter	
Joint Seals and Metal:  a. Soot to or past O-rings? b. Sooted joint surfaces? c. Heat affected or eroded O-r d. O-ring damage (installed)? e. Heat affected or eroded me f. RTV to primary O-ring? g. RTV past primary O-ring? h. Foreign material? i. Excessive grease? (including in threaded and to be the control of the cont	ings (installed)? tal?	Yes	No Comment #
Notes / Comments 2-	71, 311, 312, 298, 288	dan locati	016
1 - Aluminum Oxide Corrosion a	aunstreum of second	lan o-ringibo	th mating surfaces at
2- Scot to primary 306°-3	o-ring at two 1	scations (gas p	maths) 108-150° and
3- Soot up stream of inter mitted a corrosi	primary 0-ring ful on.	d Circumferen	ce with corresponding
4- HEAT AFFECTED PAINT O.D. IN line with	-Was Found on Gas Paths at	Bearing FWD 132.5° AND	END ZING FLANGE 318.
Preliminary PFAR(s)?Yes	No Prelimir	nary PFAR Number(s)	): <u>57C-01</u>
Clarification Form(s)? Yes	No Number	of Forms Attached:	
REVISION		DOC NO. TWR-642	PAGE A-10

# PFOR CLARIFICATION FORM General

		<del></del>		
Motor No.: RSRM-32	Side: Left (A)	Right (B)	Date: 7-13-93	
Assessment Engineer(s)/Inspector	r(s): J. Passma	n. T. Fres	on, V. Gunther	
Description: Hardness & Elect	irical Conductivit		' / /	ces at
Sketch Observations Below (inclu				
HARDNESS TESTING OF	. <del></del>			Bocknell
FWD END KING	Decree loca	.125 .250 .375	extion From Chambel	C HADDNESS 45 44 44
Point A	- 818°	./25 .250 .375	4. 4.4	· .
.250 -	/335	. 250 . 500	Rack 8	· · · · · · · · · · · · · · · · · · ·
PHANT (coerosiau)	318	.500	<b>8</b> :	
Electrical Conouci	fivity Testin a	OF Metal Si	CHACES: 90	FACS
ت ص	)=-2		41.3 41.4 6 39.3 41.24	
NOSE INET	32.5° 34.0	38.9 38.9	<i>39.5</i> 38.8	39. (
. 3	18 39.4	39.6 34.5	39.6 39.4 3	39.3
Rockwell 'B'	hardness of 44 is acceptal hardness of 88 is acceptal nductivity of 38 and above	ole for 7075-T73 aluı	minum 175-T73 aluminum	

REVISION \_

## POSTFLIGHT OBSERVATION RECORD (PFOR)



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# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 2

Motor No.: RSRM-32	Side: Left (A)		Date:	7-9-93	
Assessment Engineer(s)/Inspector	(s): W. Sperm	M. Offster		Fergus	en
Primary O-ring:  a. Heat affected or eroded O-b. O-ring defects/damage?  Secondary O-ring:  c. Heat affected or eroded O-d. O-ring defects/damage?	ring?		Yes	No No	Comment #
Notes / Comments					
Notes / Comments					
Preliminary PFAR(s)? Yes	No	Preliminary PFAR No	umber(s):	I	
Clarification Form(s)? Yes	No	Number of Forms A	ttached:		
REVISION		DOC NO. T	WR-6424	0 VOL	· 



Nozzle Internal Joint RTV - Joint 3

Motor No.: RSRM-32	Side: Left (A)	Date: 9 /01	y 25
Assessment Engineer(s)/Inspector(s	B): R. Quick P. MILC	ER W. SPERRY	
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backf  f. Foreign material?		Yes No	Comment #
Notes / Comments			
Preliminary PFAR(s)? Yes	No Preliminar	y PFAR Number(s):	
Clarification Form(s)? Yes	No Number o	f Forms Attached:	
REVISION	_	OC NO. TWR-64240 V	DL

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Internal Joint Phenolics - Joint 3

Motor No.: RSRM-32	Side: Left (A)	Date:	9 JULY 93
Assessment Engineer(s)/Inspector(	s): P. Quick P. MILLE	R W SPERI	ey
Joint Phenolics:  a. Heat affected or eroded CC or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive-GCP, within GCP, d. Phenolics axially displaced for the state of	adhesive, within adhesive, GCP-to-CCP, or within CCP)?	Yes	No Comment #
Notes / Comments			2 000
DADHESING TO HOUSING TO HOUSING 350° MAX GAP.	IL SEPHRATION NOSE	NOAT FULL C	NC FROM \$35-
	·		
Preliminary PFAR(s)? Yes	No Preliminar	y PFAR Number(s	):
Clarification Form(s)? Yes	No Number of	Forms Attached	
REVISION		OC NO. TWR-64	240 VOL PAGE A-14

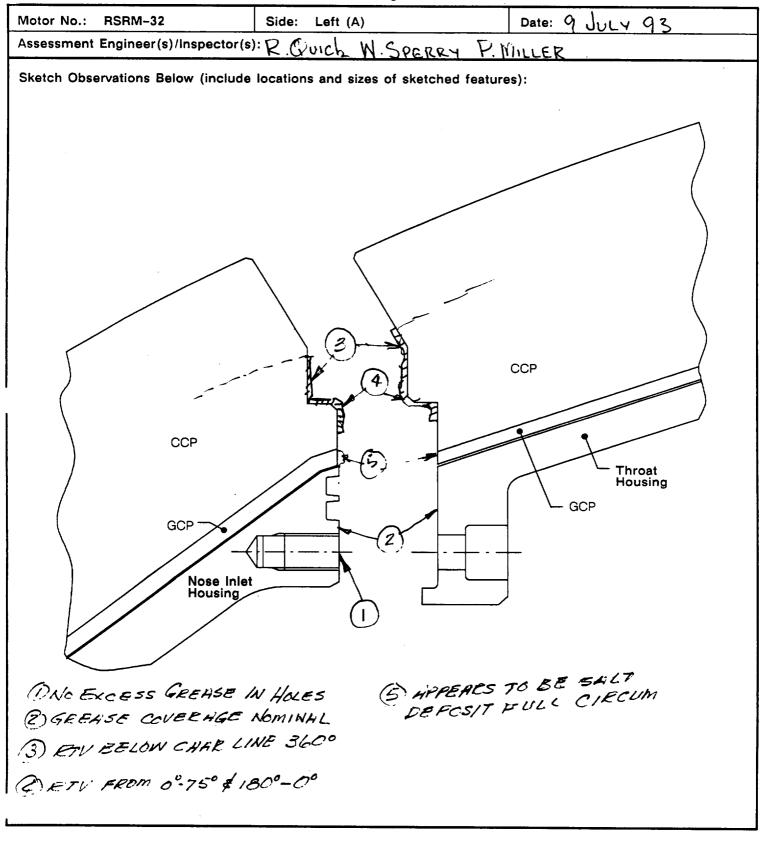


# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal - Joint 3

Motor No.: RSRM-32	Side: Left (A)		Date:	7-9-93	
Assessment Engineer(s)/Inspector(s	): W. Sperm	M. Osfolta			
Joint Seals and Metal:  a. Soot to or past O-rings?  b. Sooted joint surfaces?  c. Heat affected or eroded O-ri d. O-ring damage (installed)?  e. Heat affected or eroded met f. RTV to primary O-ring? g. RTV past primary O-ring? h. Foreign material? i. Excessive grease?   (including in threaded and ti j. Metal damage?   (including index pin and bolt helical coil inserts))	ings (installed)?	·	'es	No /	Comment #
k. Bent or broken bolts?			<del></del> •		
Notes / Comments					
Preliminary PFAR(s)? Yes	No Pro	eliminary PFAR Nu	mber(s):	<del></del>	
Clarification Form(s)?Yes	No Nu	mber of Forms At	tached:		
REVISION		DOC NO. T	WR-6424	0 VOL	<del></del>



Nozzle Internal Joint Drawing Worksheet - Joint 3



TWR-64240 DOC NO. SEC

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# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 3

Motor No.: RSRM-32	Side: Left (A)			Date:	7-9-93	•
Assessment Engineer(s)/Inspector	(s): W. Sperny.	M.	Offolter	B	Fergus	
Primary O-ring:  a. Heat affected or eroded O-b. O-ring defects/damage?	J		Y	es 	No No	Comment #
Secondary O-ring:  c. Heat affected or eroded O- d. O-ring defects/damage?	ring?				<u> </u>	
Notes / Comments		· · · · · · · · · · · · · · · · · · ·				
,						
·						
Preliminary PFAR(s)? Yes	No	Prelim	inary PFAR Nur	mber(s)	:	
Clarification Form(s)?Yes	No	Numb	er of Forms Att	ached:		
REVISION			DOC NO. TW	/R-6424	0 VOL	·



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint RTV - Joint 4

Motor No.: RSRM-32	Side: Left (A)		Date: 7 JULY	93
Assessment Engineer(s)/Inspector(s	: R. Quick	P.MILLER		
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backfil  f. Foreign material?	1?		Yes No	Comment #
Notes / Comments				
				· •
Dealinein and BEAD (1)	/			
Preliminary PFAR(s)? Yes  Clarification Form(s)? Yes	/_ No	Preliminary PFAI  Number of Form	R Number(s):	
REVISION		DOC NO.	TWR-64240 vo	

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Internal Joint Phenolics - Joint 4

Motor No.: RSRM-32 Side: Left (A)	Date: 7 JULY 93
Assessment Engineer(s)/Inspector(s): P. Quick P. Mille	
Joint Phenolics:  a. Heat affected or eroded CCP (below the char line), GCP, or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive, within adhesive, adhesive-GCP, within GCP, GCP-to-CCP, or within CCP)?  d. Phenolics axially displaced from the housing?	Yes No Comment #
Notes / Comments /- SEPARATION BETWEEN GCP AND FEC P	HOUSING FULL CIRCUM
2-SEPARATION BETWEEN GCP AND THROA MAX GAP=,021 & ONE SEPARATION WITH X.002 RADIAL	T HOUSING FULL CIRCUM HINGCPAT 180°×.70CIRCUM
	•
	•
	PFAR Number(s):
larification Form(s)? Yes No Number of	Forms Attached:
KEVISION	C NO. TWR-64240 VOL
SE .	PAGE A-19



Nozzle Internal Joint Seals and Metal - Joint 4

Motor No.: RSRM-32	Side: Left (A)	Date: 7 July 93
Assessment Engineer(s)/Inspector(	s): R. Quick P. MILLER	A. CARLISLE
Joint Seals and Metal:  a. Soot to or past O-rings? b. Sooted joint surfaces? c. Heat affected or eroded O-ring damage (installed)? e. Heat affected or eroded metal. f. RTV to primary O-ring? g. RTV past primary O-ring? h. Foreign material? i. Excessive grease? (including in threaded and j. Metal damage?	rings (installed)? etal?	Yes No Comment #
Notes / Comments		
Special Issue 3.3.1 NO CE FUNCT  () RTV TO PRIMARY	TIONAL PROBLEMS	BOOF 270° AND NO APPARENT
Preliminary PFAR(s)? Yes	No Preliminary	PFAR Number(s):
Clarification Form(s)? Yes	No Number of	Forms Attached:
REVISION	DO SE	DC NO. TWR-64240 VOL C PAGE A-20

Nozzle Internal Joint Drawing Worksheet - Joint 4

Motor No.: RSRM-32 Side: Left (A) Date: 7 JULY 93 Assessment Engineer(s)/Inspector(s): P. Quick P. MILLER A. CARLISLE Sketch Observations Below (include locations and sizes of sketched features): (1) RTV TO PRIMARY O-RING INTERMITTENTLY 360° LIGHT CORROSION ON FWO EXIT CONE AT 3540 & 00-60 SEPARATION INTERMITTENTLY 360 MAX = .015 CCP CCP **GCP** Throat **GCP** Housing Forward Exit Cone Housing 4 SEPARATION 360° MAXGAP: 02 B NO EXCESS GREASE IN HOLES AND GREASE COVERAGE WAS NOMINAL (b) MEDIUM TO HEAVY COVERAGE FULL CIRCUM 7) RTV DISCOLORED FROM SALT WATER FROM 345° THRU 0° 10 98°

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SEC		PAGE	Α	2.1

Thickol CORPORATION SPACE OPERATIONS

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 4

Motor No.: RSRM-32	Side: Left (A)		Date: ) Til	1993
Assessment Engineer(s)/Inspector	(s): A. Carliste	B. Dukk M. Lyon	s, J. Richards	<u> </u>
Primary O-ring:  a. Heat affected or eroded O-b. O-ring defects/damage?			es No	Comment #
Secondary O-ring;  c. Heat affected or eroded O- d. O-ring defects/damage?	ring?			
Notes / Comments				
Preliminary PFAR(s)? Yes	No No	Preliminary PFAR Nun	nber(s):	
Clarification Form(s)? Yes	No	Number of Forms Atta	ached:	
REVISION		DOC NO. TW	PAGE A-22	



Nozzle Internal Joint RTV - Joint 5 Motor No.: RSRM-32 Side: Left (A) Date: 8 JULY 93

	63	/_ No	Number of Fo	orms Attached:		•
liminary PFAR(s)?	Yes Yes	No		FAR Number(s		
	·					
tes / Comments <i>NIERMITTENT VO</i>	105 360	O° LARGE	ET VOID A	7 13° 20°	APPROX.	OZ DP
d. Voids within RTV? e. Foreign material?						
c. Uncured/reverted	RTV?		·			
a. Gas penetration? b. RTV not below ch	Y0			Yes	No	Comment #
int RTV:				A. CARLI		

				•	( - )			
tion Form(s)?	Yes	/_No	Number	of Forms	s Attached:			
REVISION				DOC NO.	TWR-642	40	VOL	
<del></del>				SEC		PAGE A	.–23	



Nozzle Internal Joint Phenolics - Joint 5.

Motor No.: RSRM-32	Side: Left (A)		Date: 8 JULY	93
Assessment Engineer(s)/Inspector(s	): R. Quick, P.M.	LLER, A. CAR	ELISLE	
Joint Phenolics:  a. Heat affected or eroded CCF or adhesive?  b. Physical damage?  c. Edge separations (metal-to-a adhesive-GCP, within GCP, Cd. Phenolics axially displaced from the company of the com	dhesive, within adhesiv	re,	No	Comment #
Notes / Comments				
Special Issue 3.3.2 PHENGL ADDRES	IC NOT ACCESSAE SED DURING M	818, SPECIAL NASHOUT ON	ISSUE TO P. PFOR A-4	3 <i>E</i>
	•			
Preliminary PFAR(s)? Yes	No Preli	minary PFAR Num	ber(s):	
ification Form(s)?Yes	No Num	ber of Forms Atta	ched:	
REVISION	·	DOC NO. TW	R-64240 VOL	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal - Joint 5

Motor No.: RSRM-32	Side: Left (A)	
Assessment Engineer(s)/Inspector(		Date: 8 JULY 93
Liginos (3)/mspeciol	(s): R. Quick P. MILLER	R A. CARLISLE
helical coil inserts))	rings (installed)? etal?	Yes No Comment #
k. Bent or broken bolts?		
	/	
reliminary PFAR(s)? Yes	<del></del>	PFAR Number(s):
fication Form(s)?Yes	No Number of F	Forms Attached:
REVISION	DOC	



Nozzle Internal Joint Drawing Worksheet - Joint 5
Motor No.: RSRM-32 Side: Left (A) Date: 8 JUL 493
Assessment Engineer(s)/Inspector(s): R.QUICE, P.M.LLER A. CARLISLE
Sketch Observations Below (include locations and sizes of sketched features):
NOMINAL GREASE COVERAGE
2) LIGHT CORROSION ON PACKING RING SEAL SURFACE
(3) MISSING PAINT AND CORROSION AT 260-265°
(5) MITSSING THE MEDIUM
(3)
Aft End Ring
Aft End Ring
Fixed Housing
S lance Book
Inner Boot Ring (GCP)
Fleithia Road
Flexible Boot
Flexible Bearing
Protector  APRIL REACHED AER AT LOCATIONS 90, 100-105, 235-240°
(5) SNUBBER CONTACT ON AER FROM 175-335 MAX AXIAL
DISTANCE 4.2 IN.

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Thickol CORPORATION SPACE OPERATIONS

REVISION \_\_\_

## POSTFLIGHT OBSERVATION RECORD (PEOR)

Nozzle Internal Joint O-rings (Detailed) - Joint 5										
Motor No.: RSRM-32	Side: Left (A)		Date:	8 July 19	93					
Assessment Engineer(s)/Inspector	r(s): A. Carlok	M. Lypns, J	Richards							
Primary O-ring:  a. Heat affected or eroded O  b. O-ring defects/damage?	-ring?	, , , , , , , , , , , , , , , , , , , ,	Yes	No V	Comment #					
Secondary O-ring:  c. Heat affected or eroded O d. O-ring defects/damage?	-ring?			<u> </u>						
Notes / Comments										
		•		•	,					
	-									
Preliminary PFAR(s)? Yes	No	Preliminary PFAF	R Number(s):							
Clarification Form(s)? Yes	_i/ No	Number of Form	s Attached:							

SEC



Nozzle Internal Joint Packings With Retainers (Detailed) - Joint 5

Motor No.: RSRM-32	Side: Left (A)	Date: 8 1/1/993
Assessment Engineer(s)/Inspector(	(s): A. Carlisle, M. Lyons	J. Richards
Packings With Retainers:  a. Heat affected or eroded set b. Seal or retainer defects/dar c. Medium or heavy corrosion	al or retainer? nage? ?	Yes No Comment #
Notes / Comments	Nober.	
1) Typical disass	subdy damage 16 >1 of >2	packing with retainers
	·	
Preliminary PFAR(s)? Yes	No Preliminary	PFAR Number(s):
Clarification Form(s)?Yes	No Number of	Forms Attached:
REVISION	DOO	PAGE A-28



Cowl Insulation Segments

Motor No.: RSRM-32		··							
			eft (A)			Date: 9	July	13	
Assessment Engineer(s)/In	spector(s)	: Jim	PASS	SMAN	Bot	5 Qu'i			
Cowl Insulation Segments:  a. Abnormal heat effects or erosion?  b. Soot between the cowl segment and cowl housing/SCP?  c. Uncured adhesive (silicone)?					Ye	s	No V	Commen	#
Bondline Failure Mode Perd	entage:								
	10-45	145-90	90-135	Degree   135 - 180	Location	1276-210	1 220 - 25	laur o	I
Metal-to-Adhesive	10	5	25	20	25	20	1	315-0	10.4.
Within Adhesive				<i>a</i>		, <u>, , , , , , , , , , , , , , , , , , </u>			-
Adhesive-to-SCP	. 5	2	5	7	5	5	5	Z	-
Adhesive-to-segment	85	93	70	73	70	75	93	93	
Within segment							,,,		
otes / Comments  Special Issue 3.3.3  THE COWL  COUDITION  FOUR.	INSU NO 1	NATIONS	Segmen SiNG C	TS WELL	PEIN +	exce/be	NT CONDI	TIONSO	æc



# POSTFLIGHT OBSERVATION RECORD (PFOR) Flexible Bearing Protector, Flexible Bearing, and Flexible Boot

Motor No.: RSRM-32	Side: Left (A)	Dat	e: 9 Jul	y 93
Assessment Engineer(s)/Inspector(s	s): Jim PASSI	MAN, BOB		
a. Abnormal bearing protector (including burn-through) b. Cracks through the bearing c. Soot between the bearing p d. Heat effects to the flexible t e. Bent or broken bearing prot f. Flexible boot burn-through? g. Abnormal heat effects or er h. Foreign material in the boot	and Boot: heat effects or erosion?  protector? rotector and flexible bearing bearing? ector bolts?  osion to flexible boot ID?	Yes	No,	Comment #
Notes / Comments				
Special Issue 3.3.6 N/C PB	NORMAL CONDITI	UN CBSER	VEC	
eliminary PFAR(s)?Yes	No Prelimina	ıry PFAR Numbe	r(s):	
Clarification Form(s)?Yes	No Number	of Forms Attach	ed:	
REVISION	•	DOC NO. TWR-	64240 VOL	

Motor No.: RS		Side: Left (A)	easurements (Data							
		<del></del>		Date:	14 1993					
Associated Engineer (s)/mspector (s).										
Flexible Bearing	Flexible Bearing Protector Gas Impingement Area Thickness Measurements (see figure):									
Degree Location	Thickness Measurement A* (inches)	Degree Location	Thickness Measurement A* (inches)	Degree Location	Thickness Measurement A* (inches)					
0	<u> 769</u>	120	.738	240	<u>, 0,25</u>					
10	<u>· 3/5</u>	130	1746 <u> </u>	250	=7.25					
20	<u> 1931 </u>	140	<u>•735                                    </u>	260	1/5					
30	,=35	150	· 730	270	.701					
40	<u>, 200</u>	160	-720	280	· 7/x					
50	-745	170	715	290	· 725					
60	1250	180	721	300	-3/5					
70	<u> </u>	190	.2.5	310	1230					
80	<del></del>	200	<u> </u>	320	725					
90	• 236	210	· 725	330	-7-75					
100	<u> </u>	220	<u> 1732                                   </u>	340	.726					
110	. 735	230	1.302	350	215					
* "A" is the minimum thickness of the bearing protector belly band in-line with the cowl vent holes. It corresponds to the deepest gas impingement location.  Belly Band										
Notes / Comment	ts									
		L62.4								
Clarification Form	(s)?Yes	No	Number of Forms	s Attached:						
REVISION	_		DOC NO.	TWR-64240	NOL A-31					



Noz	zle Throat Diameter Measurem	ents (Data Collecti	on Only)	
Motor No.: RSRM-32	Side: Left (A)		Date: 07-12-93	
Assessment Engineer(s)/Insp	pector(s): MIGHEL ENRIGHE	Z; RICK (	GALLEGUS	
Nozzle Throat Diameter Mea				
	Degree	Diameter Measurement		
	Location	(inches)		
	0	<u> 32 x69</u>		
	45	55.871"		
	90 135	<u>55.876"</u>		
	135	<u> </u>		
				<del></del>
Notes / Comments				
,	Avg. Throat Dio	1	= 8/27 inch 05	
	Ava. Throat Dro	meter = 3	3.001 moss	
	. 2			
			,	
arification Form(s)?	Yes No Nur	nber of Forms Atta	iched:	
			1	
REVISION		DOC NO. TY	VR-64240 VOL PAGE A 32	
		JL0	PAGE A-32	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Aft Exit Cone Assembly

Motor No.: RSRM-32 Side: Left (A) Date: /3 JULY 93						93		
Assessment Engineer(s)/Inspector(s): T. FRESTON								
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?  Note: Axial cuts may be relocated + or – 10 degrees only. Document if any cuts were relocated.								
Primary Bondline/Phenolic F	ailure Mo	de Percen	tage (Afte	r Hydrolas	e and We	dge Remo	oval):	
				Degree	Location			
	0-45	45-90	90-135	135-180	180-225	225-270	270-315	315-0
Metal-to-Adhesive	10	20	35	10	10	5	8	8
Within Adhesive								
Adhesive-to-GCP						_		
Within GCP	90	80	65	90	90	95	92	92
GCP-to-CCP								
Within CCP								
Secondary Bondline Failure	Mode Pe	rcentage (	After Rem	oval of Re	emaining F	Phenolics):	•	
,		,			Location	,		•
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								
Phenolic Removal I	Method:	NYZ	ON W	EPGE				
Notes / Comments					1.		1 -	
Notes / Comments  Special Issue 3.3.15	Jo abn	ormal	bond	line s	eparati	on mo	des.	
		_						
Preliminary PFAR(s)?	Preliminary PFAR(s)? Yes No Preliminary PFAR Number(s):							
Clarification Form(s)?	Yes	/_ N	lo Nu	ımber of F	Forms Atta	iched:		
REVISION				SEC		/R-64240	VOL	



Nozzle Phenolic Bondline - Forward Exit Cone Assembly

Motor No.: RSRM-32		Side: L	eft (A)			Date:	7-July	1993	
Assessment Engineer(s)/Ins	pector(s)	: J: *	n Pas	HAM	, TRAN	OR FR	-srow		
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?						t # 			
Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.									
Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):  Degree Location    0-45   45-70   90-135   135-180   180-25   125-270   120-315   135-0   Total									
Metal-to-Adhesive	60	55	50	60	70	60	55	75	61
Within Adhesive									
Adhesive-to-GCP	40	45	50	40	30	40	45	25	39
Within GCP						<u> </u>			_
GCP-to-CCP									
Within CCP									
Secondary Bondline Failure	Mode Pe	rcentage	(After Ren		Location		.):	-	_
Metal-to-Adhesive			1	<u> </u>		,			_
Within Adhesive		1	177						_
Adhesive-to-GCP	[		<u> </u>						
Phenolic Removal I	Mathod:								
Notes / Comments  Special Issue 3.3.16 THE BOUDINE WAS IN NOWMAL CONDITION.  DEGREE SMINICLATICAL TALKANES ADDICENT ADDITION.  DEGREE SMINICLATICAL TALKANES ADDICENT ADDITION.  OF FUND COS COS COS AFT COS AFT COS COS COS COS COS COS COS AFT COS									

Thickol CORPORATION SPACE OPERATIONS

### Nozzle Subassembly Bondline Adhesive Void Clarification Form

·									
Motor No.: RSRM-32 Side: BLeft (A) Bight (B) Date: 19-JU1-93									
Assessment Engineer(s)/Inspector(s): TREWR FRESTON JIM PASSMAN									
Nozzie Subassembly: FWD EXIT CONE									
Record Bondline Adhesive Void Measurements and Locations Below:									
Degree									
Location	Axial	Circ.	Distance From Fwd	Distance From Aft					
78	3.00	1.25		<u>7.4</u> .					
77°	0.90	0.40		(1.2					
189°	1.50	0.56		5.1					
271°	1.10	0.55		13.6					
274°	1.00	0.40		16.4					
288	0.50	0.40		(É.G					
<del></del>				<del></del>					
			<del></del>						
<del></del>									
Notes / Comments									
			•						
1 <u> </u>		<u> </u>	<b>A</b>	Number(s): (1)					
**	-		Corresponding Comment	Number(s):					
			DOC NO. TWR-2	54240 VOL					
REVISION		•	SEC SEC	PAGE OILA					



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Throat Assembly

Motor No.: RSRM-32	Side: Left (A)	Date: 21 July 93							
Assessment Engineer(s)/Inspector	(s): Jim PASSMAN "	TREVOL FRESTON							
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?									
Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.									
Primary Bondline/Phenolic Failure	Mode Percentage (After Hydrolase and '	Wedge Removal):							
Marsh to Adhasins	Degree Locati	on							
Metal-to-Adhesive	>								
Within Adhesive Adhesive-to-GCP									
Within GCP									
GCP-to-CCP									
Within CCP									
Metal-to-Adhesive Within Adhesive	Percentage (After Removal of Remaining  Degree Location								
Adhesive-to-GCP									
Phenolic Removal Method:		,							
Notes / Comments  (1) Few Voids ~ . 20DIA.  (2) HERUY COLROSSION ENTIRE SURFACE.									
reliminary PFAR(s)?YesNo Preliminary PFAR Number(s):									
Clarification Form(s)? Yes	No Number of Forms A	ttached:							
revision	DOC NO.	TWR-64240 VOL PAGE A-35							

Thickol CORPORATION SPACE OPERATIONS

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline - Forward Nose and Aft Inlet Rings

Motor No.: RSRM-32	Side: Left (A)				Date: 7/22/93					
Assessment Engineer(s)/Inspector(s): P. Quick T. FRESTON										
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal? c. Voids in adhesive greater than 0.5 inch in any direction? d. Corrosion? e. Foreign material?  Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.										
Primary Bondline/Phenolic Failure Mode Percentage (After Hydrolase and Wedge Removal):										
	101/5	IVE BA	100 126	_	Location	100E 770	1070 215	512 <i>(C-1</i> )		
Metal-to-Adhesive	100%	100%	60%	60%	100%	100%	100%	100%		
Within Adhesive	700 70	10076	60 18	6010	70078	100/6	10070	1,55,5		
Adhesive-to-GCP			40%	40%						
Within GCP			1	2070						
GCP-to-CCP										
Within CCP										
Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):  Degree Location										
Metal-to-Adhesive										
Within Adhesive										
Adhesive-to-GCP		<u> </u>				<u> </u>				
Phenolic Removal	Method:									
Notes / Comments / NGC	0% ADH	ESIVE R	CORROS	NG WAS	ON TH	E AFT	INLET	RING AREA		
Special Issue 3.3.7 Nii										
Special Issue 3.3.10 5EE CLARIFICATION FORM 4-364										
Preliminary PFAR(s)?	Yes					nber(s):				
Clarification Form(s)?	/_ Yes	!	No Nu	ımber of l	Forms Att	ached: <u>A</u>	1-36A	A-36B		
revision				DO		VR-64240	VOL 36			

Thickol CORPORATION SPACE OPERATIONS

REVISION \_\_\_

#### Nozzle Subassembly Bondline Adhesive Void Clarification Form

		•		•
Motor No.: RSRM	-32	Side: 🛭 Le	eft (A) Right (B) Date: 7	/22/93
Assessment Engineer	r(s)/inspector(	s): R. Quic	k T. FRESTON	
Nozzie Subassembiy:	FORWAR	,	D AFT INLET RING	
Record Bondline Adh	esive Void Me	asurements and	Locations Below:	
Degree	Void	Size	Location on Bond	ing Surface
Location	Axial	Circ.	Distance From Fwd FACE OF NOSE RING	Distance From Aft
20	.52	.27	.95	
_110°	.37	.26	1.70	
1220	48	30_	_,90_	
1270	36	.21	1.95	
2200	.60	.32	34_	
2220	4/_	.28	1.66	
2550	.42	.25	2.30	
3180	.35	21_	.90	
359°	_,37_	.25	2.20	
<del></del>			•	
			<del></del>	
<del></del>				
<del></del>				
Notes / Comments				
			•	
	······································			
1			Corresponding Comment Num	ber(s):
	-			

DOC NO.

Thickol CORPORATION SPACE OPERATIONS

## PFOR CLARIFICATION FORM General

	T	· · · · · · · · · · · · · · · · · · ·		<del></del>		
Motor No.: RSRM-32	Side: 🗵 L	.eft (A)	Right (B)	Date:	7-22-93	-
Assessment Engineer(s)/Inspecto	r(s): R. Qu:	clc, M	. Clark			·
Description: LDI Datas	heat					
Sketch Observations Below (inclu	ide locations ar	nd sizes of s	ketched fea	atures):		
•	OSE CAP TO HO			•		
••••		Hand)				
Degree Location Di Recorded Actual Recorde	stance <sup>1</sup> ed Actual	Void or Repair	Axial Length	Circ. <u>Width</u>	Other Info.	
1 21 11.30		FOUND VOIS	·38	25_	NOT FOUND	-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$					NOT FOUND	4.
79 7.60 163 /63 11.10		VOLE_	.80	.45	MDI FOUND	а С
177 <u>177</u> 10.84 316 316 9.20	7.85 8.40	VOIP	.43	40		nterf
•			<del>.</del>			int
	NOSE CAP TO (Left	FNR BOND: Hand)	LINE			ass
Degree Location Di Recorded Actual Record	stance² ed Actual	Void or Repair	Axial Length	Circ. <u>Width</u>	Other <u>Info.</u>	ap gl housi
19 <u>1.77</u>					NOT FOUND	מט ת
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1.20	VOID	.30	.20	———	9 8 9 Q P
27 2.08 48 1.98 131 1.95	1.20 1.30	-VOID	.30	20		r a C
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1.70 2.00	<u>VOID</u>	<u> 30</u> .25	20 20_		of urf ose
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1.30	VOIP	.20	.10	NOT FOUND	tip e sin
283 <u>1.86</u> 306 <u>2.24</u>	1.10	VOID VOID	<u>.30</u> 30	<u>-20</u> -20		E
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2,10	VOID	./5	.10	NOT FOUND	fwd flai FNR
	<del></del>					rom rom
						4444
	FNR TO HOUS	SING BONDL t Hand)	INE			nce nce
<u>.</u>	•	Void or	Axial	Circ.	Other	stance stance stance
Degree Location Di Recorded Actual Record	istance <sup>3</sup> led Actual	<u>Repair</u>	<u>Length</u>	Width	Info.	Dii
110 0.00 290 0.00					NOT FOUND	- N F
<del></del>						

DOC NO.	TWR-64240	VOL
SEC	PAGE A	-36B



		Nozzie Ph	enolic Bor	ndline - No	ose Cap				
Motor No.: RSRM-32			eft (A)			Date: 7	122/93	)	
Assessment Engineer(s)/Ins	pector(s):	R.Qui	ch T	FRES	TON				
Metal Housing Bondline Sur	face: ded metal	. 1220 A 1211 - 12 ?	,		Yes		¥2	Comment	* - -
Note: Axial cuts may be re Primary Bondline/Phenolic F								d.	
				Dograd	Location				
	10-45	45-90	190-135	Degree コミニ <i>I</i> 名へ	1180 -225	225-270	1270-81	1315-0	1
Metal-to-Adhesive		, , ,	/- /00	100		220 270	4,0 4,	13/3-0	
Within Adhesive Adhesive-to-GCP					-				
Within GCP									_
GCP-to-CCP Within CCP	100%	100%	100%	100%	100%	100%	100%	100%	
Secondary Bondline Failure				Degree	Location	•		1315-0	14.4.1
Metal-to-Adhesive	30%	40%		40%					36
Within Adhesive			3-7	1 10	1 - / 5	00/0	3-75	10/0	٥٥
Adhesive-to-GCP	70%	60%	65%	60%	55%	76%	70%	60%	64
Phenolic Removal N				•		1 10/0	1 70	10070	-
Notes / Comments /- 2/G.  Special Issue 3.3.7 No.	ROLAZE	EROSI	ON ON A	XIAL C	UT FWE	TIPAT	INT FU 10° & T	ILL CIR	CUM
Special Issue 3.3.8 VO/A 3 SMALL VOID Special Issue 3.3.9 VO. FWD END. BAXIAL Preliminary PFAR(s)?	SATZ	830	FORWAR M APT X 77° 280	58AXIA	12×.252	IRCUM,	163°6.	4 FROM LIRCUM 45 AXIALX	: 4C/K
Clarification Form(s)?	Yes	No	o Nui	mber of F	orms Atta	ched:		·	
REVISION				DOC	NO. TW	'R-64240	VOL A-37	<del></del>	



## POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline - Cowl Assembly

Motor No.: RSRM-32		Side: Le	ft (A)			Date: 7/21/91			
Assessment Engineer(s)/Inspector(s): J.M. PASSMAN, TREUCR FRESTON									
Metal Housing Bondline Sur  a. Soot? b. Heat affected or ero c. Voids in adhesive gr d. Corrosion? e. Foreign material?  Note: Axial cuts may be rel	face: ded meta eater than	1? n 0.5 inch	in any dire	ection?	Yes		No V	Comment #	
Primary Bondline/Phenolic F									
	0-45	145-90		135-100		225-270	2703b	315-360	
Metal-to-Adhesive	15	5	2	Z	Z	5	0		
Within Adhesive Adhesive-to-SCP	85	95	98	93	98	95	100	100	
Within SCP SCP-to-CCP Within CCP				5					
Secondary Bondline Failure	Secondary Bondline Failure Mode Percentage (After Removal of Remaining Phenolics):								
	1	I	11/	Degree	Location	-	1		
Metal-to-Adhesive			A						
Within Adhesive			77		-				
Adhesive-to-SCP							<u> </u>		
Phenolic Removal N	Vlethod:					· · · · · · · · · · · · · · · · · · ·			
l-tid	asadar				Licat	ED AT	SHIMS	OR.	
Special Issue 3.3.7 /	to vois	IS WERE	E FOUN	D,					
Special Issue 3.3.13 BOND/INE WAS IN GOOD SHAPE VERY LOW (~ 49) METAL TO ADHESIVE FAILURE MODEL 9595 ADHESIVE - 40500.									
Preliminary PFAR(s)?	Yes	N	o Pr	eliminary	PFAR Nun	nber(s): _			
Clarification Form(s)?	Yes	N	io Nu	ımber of l	Forms Atta	ached: _			
REVISION				SEC		VR-64240	VOL GE A-38		



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Fixed Housing Assembly

Motor No.: RSRM-32		Side: Le	ft (A)			Date: 14	JULY	93	
Assessment Engineer(s)/Ins	pector(s	: R.Q.	nck	PMIL	LER				
Metal Housing Bondline Sur a. Soot? b. Heat affected or ero c. Voids in adhesive gr d. Corrosion? e. Foreign material?	oded meta reater tha	n 0.5 inch		•	Yes			Comment /	# 
Note: Axial cuts may be re Primary Bondline/Phenolic I								<b>u.</b>	
•					Location				
	0-45	45-90	90-135	-		225-270	270.315	315-0	1
Metal-to-Adhesive								,	_
Within Adhesive		_				-			-
Adhesive-to-GCP		2.0	1.5.00	1000/	1000/	- ~	e/	1000/	-
Within GCP	100%	100%	100%	100%	100%	100%	100%	100%	-
GCP-to-CCP									1
Within CCP			<u></u>		L	<u> </u>	1	<u> </u>	J
Secondary Bondline Failure	Mode Po	ercentage (	After Rem				:		
	I	I	1	Degree 	Location	ı	1	1	Total
Metal-to-Adhesive					2%			<del> </del>	0.25
Within Adhesive									1
Adhesive-to-GCP	100%	100%	100%	100%	98%	100%	100/0	100%	99.75
Phenolic Removal I	Method:			<i>N</i> :	YCON	WEDG	Ē		- -
Notes / Comments  1.60% .4 FROM A  90° 1.6 FROM A  Special Issue 3	F EN	D LOA	x 124 / ×	30 C/	RCUM	rowth	- inth	2 0 0 0	-S
Preliminary PFAR(s)?		/				mber(s):			
Clarification Form(s)?			No N	umber of	Forms Att	ached: _			
revision				DOO		VR-64240	VOL GE A-39	<del>.</del>	

Thickol CORPORATION SPACE OPERATIONS

#### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Phenolic Sections - Aft Exit Cone

	1	1		
Motor No.: RSRM-32	Side: Left (A)	Date:	8-27-93	3
Assessment Engineer(s)/Inspector(s	): M. Clark			
Phenolic Sections:  a. Cross-ply cracking in virgin r b. Ply lifting?  Aft Exit Cone Char and Erosion Mea		Yes ———	No Cor	mment #
Station 0°	90°	180°	270	0
Location Erosion Char	Erosion Char	Erosion Char	Erosion	Char
73.77				
777.77			_	
83.77				
89.77	- 1017	· ·		
95.77	- HA			
101.77				
107.77				
113.77		·		
118.77				
Negative Margin of Safety?	Yes No	Station:	Degree:	
Notes / Comments				
Special Issue 3.3.19 Pieces	resovered at KSC not been ossesse	have been mi	esplaced an	-6
DNone of the CCF to allow measurem	remained a ents to be tal	Hacked .	to housh	ns
Preliminary PFAR(s)? Yes	No Prelimina	ary PFAR Number(s	·):	
larification Form(s)? Yes	No Number	of Forms Attached	:	
REVISION		DOC NO. TWR-64	240   VOL   PAGE A-40	_



## POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections – Forward Exit Cone

Лotor No.: RS	SRM-32		Side: Left	· · · · · · · · · · · · · · · · · · ·		Date:	8-26-9	' 3
ssessment En	gineer(s)/lns	pector(s):	L.E. H	リはんど	S		•	
nenolic Sectio a. Cross-pl b. Ply liftin	y cracking in	ı virgin ma	terial?			es	No Co	omment #
orward Exit Co	ne Char and	Erosion M	easurements	:				
Station	0,	•	90°		180	180°		0°
Location	Erosion	Char	Erosion	Char	Erosion	Char	Erosion	Char
1.0	.37	<u>.75</u>	<u>.37</u>	<u>.76</u>	.33	<u>.78</u>	.36	<u>,76</u>
4.0	.36	.73	<u>,35</u>	<u>.76</u>	.34	<u>.74</u>	<u>.37</u>	<u>.74</u>
4.6	<u>.37</u>	.7/	.37	<u>.72</u>	.36	.75	.36	<del>• 77</del>
8.0	<u> 35</u>	.7/	.37	.68	.3.	.70	<u>.37</u>	.74
12.0	.35	.76	<u>,3Z</u>	<u>.73</u>	.33	.70	<u>,33</u>	<u>,6</u>
16.0	1.F	14	1/A	<u> 17 E</u>	NA	-/-	1/F	· <u>/</u>
20.0								
24.0	MA	XX						
28.0	.30	.70	NA	11P	.28	,70	<u>.72</u>	
32.0	,21	,75	<u>. 19</u>	.78	,25	.68	.19	<u>.82</u>
32.9	,18	.70	. 19	175	.16	.7/	.15	<u>.81</u>
34.0	.15	.67	.15	.75	, ,—	.74	.14	.8 <u>=</u>
Negative M	largin of Safe	ety?	Yes	N	o Station	n:	Degree:	
otes / Comme	ents							
Preliminary PF	AR(s)?	Yes	No	Prelimi	nary PFAR N	umber(s):		
larification Fo	orm(s)?	Yes	No	Numbe	r of Forms A	Attached:		
REVISION	ı				DOC NO.	TWR-642	40 VOL	



## POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections - Throat Assembly

	· · · · · · · · · · · · · · · · · · ·	INOZZ	tie Phenolic Se	**	nroat Assemi	<del>,                                      </del>		
	SRM-32		Side: Left (	(A)		Date:	8	
Assessment En	gineer(s)/Ins	pector(s):	L,E. W	<i>は、ドモ</i> タ	>			
a. Cross-pl b. Ply lifting	ly cracking in	n virgin m	aterial?		Y	'es	No C	omment #
Throat Inlet Rin	ng and Throa	t Ring Cha	ar and Erosion	Measurem	ents:			
Station	0	•	90	0	180	)°	27	0°
Location	Erosion	Char	Erosion	Char	Erosion	Char	Erosion	Char
1.0	1.07	.62	1,66	,6Z	1.06	.68	1.03	<u>.62</u>
2.0	<u>/, //                                  </u>	.71	1.08	.61	1.09	.66	1,07	.65
4.0	<u>1, 17</u>	.68	1.14	.68	1,16	<u>.59</u>	1,12	. <sub>2</sub> .
6.0	1.23	.63	1,20	.64	1.20	.64	1,19	.70
8.0	1.29	.50	1,21	.56	1,2 -	50	1,23	
10.0	1.18	.56	1.19	,54	1.18	7-5-	1,15	,55
12.0	1.15	.60	1.16	.57	1.14	,6Z	1,13	,60
14.0	1.13	.62	1.16	,58	1,15	.=9	1,13	.56
16.0	1.08	.69	1,05	.68	1,10	.65	1.14	. <i>च</i> ु
18.0	.96	,78	,95	.76	.96	,68	.94	.66
20.0	.76	.80	.78	.7/	.77	,75	.72	77
22.0		.80	.51	.81	.51	.81	,47	.84
23.0	.44	.82	,47	.80	.44	.80	41	EZ
Negative Ma	argin of Safe	ty?	Yes _	No.	Station	:	Degree:	
Preliminary PFA		Yes Yes	No		of Forms At			
REVISION _			•		DOC NO. T	WR-6424	0 VOL	_



Nozzie	Phenolic	Sections	_	Forward	Nose	and	Aft	Inlet	Rings
		000				u			90

Motor No.: RSRM-32	Side: Left (A)	Date: 8/26/93
Assessment Engineer(s)/Inspector(s	): CLARK, PASSMAN, QUICK	
Phenolic Sections:  a. Cross-ply cracking in virgin r b. Ply lifting?	,	Yes No Comment #
Forward Nose Ring Char and Erosion	n Measurements:	
Station 0°	90° 1	80° 270°
Location Erosion Char	Erosion Char Erosion	Char Erosion Char
28.0 <u>1.22 .66</u>	<u>1.10 .58                                    </u>	<u> 1.15 .67</u>
30.0 <u>.93</u> <u>.60</u>		.66 .93 .64
32.0 <u>.93</u> <u>.64</u>	<u>.90 .59 .92</u>	<u>.55  .01 .66</u>
Negative Margin of Safety?	Yes/ No Station	on: Degree:
Aft Inlet Ring Char and Erosion Mea	surements:	
Station 0°		80° 270°
Location Erosion Char	Erosion Char Erosion	Char Erosion Char
34.0 <u>.88 .6/</u>		· · · · · · · · · · · · · · · · · · ·
36.0 <u>.90</u> <u>,60</u>	<u>.86 .99 .92</u>	<u>.55 _91 _67</u>
38.0 <u>.96 .53</u>	<u>.94 .64 .98</u>	<u>.56 .98 .72</u>
39.0 <u>.99</u> <u>.56</u>	.94 .56 1.00	.61 1.01 .70
Negative Margin of Safety?	Yes No Statio	on: Degree:
Notes / Comments		
Preliminary PFAR(s)? Yes	No Preliminary PFAR !	Number(s):
larification Form(s)? Yes	No Number of Forms	Attached:
REVISION	DOC NO.	TWR-64240   VOL   PAGE A-43

# Thickol CORPORATION SPACE OPERATIONS

REVISION \_\_\_\_\_

### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections - Nose Cap

Motor No.: RSRM-32  Assessment Engineer(s)/Inspector(s  Phenolic Sections:  a. Cross-ply cracking in virgin n	Side: Left (A) ): CLARK, PASSMAK	Date:	8/25/93 5
Phenolic Sections:	LLMICK, I-HUSWIAK	, YUILK, VYILKE.	<del>~</del>
b. Ply lifting?		Yes	No Comment #
Nose Cap Char and Erosion Measure	ements:		
Station 0°	90°	180°	270°
Location Erosion Char	Erosion Char	Erosion Char	Erosion Char .85米
1.5 <u>.29</u> <u>.50</u>	.74*	<u>.70*</u>	
4.0 <u>.40 .48</u>	.40 .43	.32 .51	.33 .56
6.0 <u>.4/ .53</u>	.42 .48	.33 .53	.37 .47
8.0 <u>.49</u> .5/	.44 .49	.44 .39	.43 .49
10.0 <u>.56 .47</u>	.50 .48	.45 .45	49 .5C
12.0 <u>.58</u> .5/	.48 .49	.45 .49	.49 .50
14.0 .70 .44	.65 .51	.58 .42	.59 .48
16.0 .78 .46	.69 .43	.61 ,46	.62 .45
18.0 .94 .44	.81 .38	.76 .41	.71 .47
20.0 1.15 .51	1.05 .39	.93 .47	.95 .47
22.0 1.79 .63		1.57 .63	1.49 .88
24.0 1.94 .70	1.79 .71	1.76 .78	1.85 .89
26.0 <u>1.40</u> .70	1.27 .76	1.30 .77	1.45 .79
Negative Margin of Safety?	Yes <u>/</u> N	o Station:	Degree:
Notes / Comments * DENOTES	MAX AFFECTE D	EPTH	
Preliminary PFAR(s)? Yes		nary PFAR Number(s)	•
larification Form(s)? Yes	No Numbe	r of Forms Attached:	
		DOC NO. TWR-642	40   VOL

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Nozzle Phenolic Sections - Cowl

Motor No.: RSRM-32 Side: Left (A)					Date:	5-8-		
Assessment Engineer(s)/Inspector(s): L.E. will 155								
Phenolic Sections:  a. Cross-ply cracking in virgin n b. Ply lifting?  Cowl Char and Erosion Measuremen					Ye	es	No Co	omment #
					400	.0	0.7	<b>8</b> 0
Station Location	0° Erosion	Char	90 Erosion	Char	180 Erosion	Char	27 Erosion	Char
0.3	, 30	,80	.3/	.7Z	.30	.7/		78
1.0	.29	,73	,32	.66	,27	,68	.26	<del></del>
2.0	,27	,69	.25	.68	,23	.6Z	22	. 6 7
3.0	,26	.65	.22	.69	.20	.66	.2/	.7/
4.0	.24	.62	.19	.68	,18	, 63	.18	<del>.</del> 72
5.0	,20	.78	,18	.72	,15	.69	16	7/
6.0	.16	.70	.15	.67	.14	.76	14	,70
6.8	.27	.82	.15	.87	.18	.82	,23	.32
Notes / Comments  Special Issue 3.3.17 Post size Could Color Color Margin of Safety?  Notes / Comments  Of the size of the color Color Color Margin Margin Size of the size of								
Preliminary PFAI		Yes Yes	No		nary PFAR Nu r of Forms At	-		
REVISION _					DOC NO. T	WR-6424	O VOL	



Nozzle Phenolic Sections - Fixed Housing

Motor No.: RSRM-32 Side: Left (A)				Date:	B-26-	93		
Assessment E	Engineer(s)/Ins	spector(s):	L.E. W	ILKES				
Phenolic Sections:  a. Cross-ply cracking in virgin material?  b. Ply lifting?								
Fixed Housing Char and Erosion Measurements:								
Station	0	0	90	)°	1	80°	270°	
Location	Erosion	Char	Erosion	Char	Erosion		Erosion	
0.0	<u>.08</u>	1.20	.05	1.12	.04	1,13	,00	_ 1.2/
1.0	,04	1.13	.06	1,06	.02	1,03	.01	1.08
2.0	,00	1,07	.01	.96	,02	1,10	,04	
3.0	.03	.97	.01	<u>,97</u>	.00	1,13	.03	1,05
4.0	,03	1,01	,01	<u>,93</u>	.01	1.07	.04	
5.0	.01	1,00	.01	.91	.00	1.04	<del></del>	
6.0	.01	1.04	.00	<u>. + = </u>	.00	1.04	.05	
7.0	.01	1.02	.00	.92	,01	.99	,00	
8.0	,00	.92	.00	<u>.78</u>	,00	.86	.00	<u>,93</u>
9.0	.00	,93	<u> X/ A</u>	<u>,73</u> *	.00	<u>.83</u>	.00	
10.75	.02	1.84	NA	1.84*	- 15	1,45	.00	1.73
Negative Margin of Safety? Yes No Station: Degree:								
Notes / Comr	ments 🗡 💯	THE HEA	TATICO	CD DED	THE CHA	(118)		
Special Is	ssue 3.3.2 🗲	EE PFOR	PAGE	A-24.				
	-							
Preliminary PFAR(s)? Yes No Preliminary PFAR Number(s):								
arification F	Form(s)?	Yes	No	Numbe	r of Forms	Attached:		
REVISIO	ON				DOC NO.	TWR-6424		
Carrier Contract					SEC		PAGE A-46	

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Nozzle Phenolic Sections - Outer Boot Ring and Flexible Boo

Motor No.: RSF	RM-32	1	Side: Left (A	<del></del>			8-24-	03
Assessment Engi	Assessment Engineer(s)/Inspector(s): 1.E.W.							
Phenolic Section  a. Cross-ply  b. Ply lifting	cracking in	virgin mat	erial?			es	No	Comment #
Flexible Boot/Out c. Separatio d. Heat effe	ns?				-			/
Outer Boot Ring	Char and E	rosion Mea	surements:					
Station	0	•	90	o '	18	0°		270°
Location	Erosion	Char	Erosion	Char	Erosion	Char	Eros	
8.0	<u>.:0</u>	<u> </u>	10_	<u>.82</u>	.07		•	4 /= -
9.0	.09	<u>.9/</u>	.10	<u>.80</u>	.03	.94		= 1,01
10.0	.05		.08	<del>,79</del>	.01		<u>.0</u>	<u> </u>
11.3	.07	<u>,92</u>	,07	<u>.8/</u>	,00		,0	
Negative Margin of Safety? Yes No Station: Degree:								
			Degree Location 0	Ren	Plies naining			·
			90		5,2			
			180		· /			
			270		· /			
Neg	gative Margi	n of Safety	/?	Yes	No	Degree	e:	
Notes / Commen	nts D se	PARFYLD FE	WER EFFE	E OFFE	PE FOU	- 0° A	10 c70 5 = 70 f / 5	3 = 1 = 1
Preliminary PFAF	R(s)?	Yes	No	Prelimin	ary PFAR Nu	ımber(s):		
larification Forn	n(s)?	Yes	No	Number	of Forms A	ttached:	· · · · · · · · · · · · · · · · · · ·	_
revision _					DOC NO.	ΓWR-6424	10 vo	<del></del>

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## POSTFLIGHT OBSERVATION RECORD (PFOR) Barrier-Booster Leak Check Port Plug and Port (At Removal) - 126 Degrees

Motor No.: RSRM-32	Side: Left (A)	D	ate: 7-9-93
Assessment Engineer(s)/Inspector	(s): S. Eden, M.	Lyon, C. Taylor,	L. MacCauley
Leak Check Port Plug and Port:  a. Soot to or past O-ring?  b. Sooted surfaces?  c. Heat affected or eroded O- d. O-ring damage (installed)?  e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?	- etal?	Yes	No Comment #
Notes / Comments			
Preliminary PFAR(s)? Yes	s No Pi	reliminary PFAR Num	ber(s):
Clarification Form(s)? Yes	No N	umber of Forms Atta	ched:
REVISION		DOC NO. TWE	R-64240 VOL PAGE A-48



Barrier-Booster Leak Check Port Plug and O-ring (Detailed) - 126 Degrees

Motor No.: RSRM-32 Side: Left (A)	Date: 7-9-93
Assessment Engineer(s)/Inspector(s): S. Eden, M.	Lyon, C. Taylor, L. MacCauley
Leak Check Port Plug:  a. Foreign material between the O-ring and plug?  b. Heat affected or eroded metal?  c. Seal surface/thread damage?	Yes No Comment #
Secondary O-ring:  d. Heat affected or eroded O-ring?  e. O-ring defects/damage?	
Notes / Comments	
	·
	•
Preliminary PFAR(s)?YesNo	Preliminary PFAR Number(s):
Clarification Form(s)?YesNo	Number of Forms Attached:
REVISION	DOC NO. TWR-64240 VOL  SEC PAGE A-49



Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 2

Motor No.: RSRM-32	Side: Left (A)	Date: 7-9-9:	3
Assessment Engineer(s)/Inspector	(s): W Sperm	M. Offolter	
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Toro	ring (installed)? etal?	Yes No  Yes No	Comment #
Notes / Comments		,	
Preliminary PFAR(s)? Yes		eliminary PFAR Number(s):	
Clarification Form(s)? Yes	SNo Nur	mber of Forms Attached:	
REVISION	•	DOC NO. TWR-64240 VOI SEC PAGE A-50	



Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 2

Motor No.: RSRM-32	Side: Left (A)		Date: 7	-9-93	
Assessment Engineer(s)/Inspector	(s): W. Sperm	M. Off	olter		
Leak Check Port Plug:  a. Foreign material between t b. Heat affected or eroded mage c. Seal surface/thread damage	etal?	•	Yes	No V	Comment #
Secondary O-ring:				,	
d. Heat affected or eroded O-	ring?				
e. O-ring defects/damage?					
Notes / Comments					
					-
					•
	•				
Preliminary PFAR(s)?Yes	s No	Preliminary PFAF	R Number(s):		
Clarification Form(s)? Yes	No No	Number of Form	s Attached:		
REVISION		DOC NO.	TWR-6424	0 VOL	
				A-31	



Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 3

Motor No.: RSRM-32	Side: Left (A)		Date: 7 -	9-93
Assessment Engineer(s)/Inspector	(s): W. SPERRY	M. OFFOLTER		
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded med f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Toro	ring (installed)? etal?		/es No	Comment #
Notes / Comments				
Preliminary PFAR(s)?Yes	<b>-</b>	Preliminary PFAR N		
Clarification Form(s)? Yes	s <u>v</u> No	DOC NO. T	WR-64240	VOL A-52



Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 3

Motor No.: RSRM-32	Side: Left (A)	Date: 🕊 🐬	-9-93
Assessment Engineer(s)/Inspector	(s): W. Speny, M.	Offalter, B. For	34504
Leak Check Port Plug:  a. Foreign material between to b. Heat affected or eroded me c. Seal surface/thread damage	etal?	Yes No	Comment #
Secondary O-ring:		,	
d. Heat affected or eroded O-	ring?		
e. O-ring defects/damage?			
Notes / Comments			
		•	
Preliminary PFAR(s)? Yes	s No Prelim	ninary PFAR Number(s):	
Clarification Form(s)? Yes	s No Numb	er of Forms Attached:	
REVISION		DOC NO. TWR-64240 SEC PAGE A-	VOL



REVISION \_\_\_\_

## POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) – Joint 4

Motor No.: RSRM-32	Side: Left (A)		Date: ) July	1993
Assessment Engineer(s)/Inspector	(s): A Carlisle,	B. Quick, M. Lyo	ns. J. Richards	
Leak Check Port Plug and Port:  a. Soot to or past O-ring?  b. Sooted surfaces?  c. Heat affected or eroded O- d. O-ring damage (installed)?  e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Tore	ring (installed)? etal?		es Nø	Comment #
Notes / Comments				
•				
	•			
Preliminary PFAR(s)? Yes	: No	Preliminary PFAR Nu	ımber(s):	
Clarification Form(s)? Yes	No No	Number of Forms A	ttached:	-
		DOO NO T	WP_64240 VO	

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Nozzle Internai Joint Leak Check Port Plug and O-ring (Detailed) - Joint 4

Motor No.: RSRM-32	Side: Left (A)	Date: 1 July 1993
Assessment Engineer(s)/Inspector(	(s): A. Carlisk, B. Quick.	M. Lyuns, J. Richards
Leak Check Port Plug:  a. Foreign material between the between the between the between the c. Seal surface/thread damage.  Secondary O-ring:	he O-ring and plug? etal? e?	Yes No Comment #
<ul><li>d. Heat affected or eroded O- e. O-ring defects/damage?</li></ul>	ring?	
Notes / Comments		•
Preliminary PFAR(s)? Yes	No Preliminary Pl	FAR Number(s):
Clarification Form(s)? Yes	No Number of Fo	orms Attached:
REVISION	DOC N SEC	10. TWR-64240 VOL



Nozzie Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 5

Motor No.: RSRM-32	Side: Left (A)		Date: 8JUV	1953
Assessment Engineer(s)/Inspector	(s): A. Carly3/	M. Lyons, J.	Richards	
Leak Check Port Plug and Port:  a. Soot to or past O-ring?  b. Sooted surfaces?  c. Heat affected or eroded O-  d. O-ring damage (installed)?		- -	Yes No / / / / / / / / / / / / / / / / / /	Comment #
e. Heat affected or eroded me		_		
f. Foreign material?			1/1	
g. Excessive grease?				
h. Medium or heavy corrosion	1?	_		
i. Metal damage?		_	<u> </u>	
Plug Break-away and Running Tord	ques (inch-lbs):	Break-away Running:	: 3)	
Notes / Comments	4			
	<i>)</i>			
Preliminary PFAR(s)? Yes	sNo	Preliminary PFAR N	Number(s):	
Clarification Form(s)? Yes	No No	Number of Forms	Attached:	
REVISION		DOC NO.	TWR-64240 VOL	<del></del>

Thickol CORPORATION SPACE OPERATIONS

## POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 5

Motor No.: HSRM-32	Side: Left (A)	Date: 8 Ou	14/73
Assessment Engineer(s)/Inspector	(s): A. Coliste, M. L	7045, J. Richards	
Leak Check Port Plug:  a. Foreign material between t  b. Heat affected or eroded me  c. Seal surface/thread damage	etal?	Yes No	Comment #
Secondary O-ring: d. Heat affected or eroded O- e. O-ring defects/damage?	ring?		
Notes / Comments			
	•		
Preliminary PFAR(s)? Yes	No Prelimi	nary PFAR Number(s):	
Clarification Form(s)? Yes	No Numbe	r of Forms Attached:	······································
REVISION		DOC NO. TWR-64240 SEC PAGE	vol.



Case Factory Joint - Forward Dome

Motor No.: RSRM-32	Side: Left (A)	Date:	21 SEP
Assessment Engineer(s)/Inspector(	(s): Birch		
Joint Seals and Metal:  a. Heat affected or eroded Obb. Heavy corrosion (pitting) in C. Heavy corrosion (pitting) in Note: Remove corrosion to determinate the corrosion of the	i joint? I leak check port? Inine if pitting has occurred reen Scotch-Brite® pads m	nay be used to remove	
Notes / Comments			
Preliminary PFAR(s)? Yes	No Prelim	inary PFAR Number(s):	
Clarification Form(s)? Yes	No Numbe	er of Forms Attached:	· .
REVISION	,	DOC NO. TWR-6424	0 VOL



## POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint – Forward Cylinder/Cylinder

Motor No.: RSRM-32	Side: Left (A)	Date:	21 1993		
Assessment Engineer(s)/Inspector	(s): Birch				
Joint Seals and Metal:  a. Heat affected or eroded O- b. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	joint?	Yes	No Comment #		
hardware. Solvent and/or g	Note: Remove corrosion to determine if pitting has occurred. Care should be taken not to damage the hardware. Solvent and/or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.				
Notes / Comments					
Proliminary PEAP (a) 2	No. Buolinaine	, DEAD Number(a)			
Preliminary PFAR(s)? Yes		PFAR Number(s)	•		
Clarification Form(s)? Yes	No Number of	Forms Attached:			
REVISION	DO SEC	C NO. TWR-6424	0 VOL PAGE A-59		



### POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint - Forward Center

Side: Left (A) Motor No.: RSRM-32 Date: 09-28-93 Assessment Engineer(s)/Inspector(s): A.ZAREMBA Joint Seals and Metal: Yes No Comment # a. Heat affected or eroded O-ring? b. Heavy corrosion (pitting) in joint? c. Heavy corrosion (pitting) in leak check port? Note: Remove corrosion to determine if pitting has occurred. Care should be taken not to damage the hardware. Solvent and/or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only. Notes / Comments Preliminary PFAR(s)? \_\_\_\_ Yes Preliminary PFAR Number(s): \_\_ Clarification Form(s)? Number of Forms Attached: REVISION \_\_\_\_\_

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Case Factory Joint - Aft Center

Motor No.: RSRM-32	Side: Left (A)	Date: 9-22-93
Assessment Engineer(s)/Inspector	(s): G RICH	
hardware. Solvent and/or g	ring? i joint? i leak check port? nine if pitting has occurred. Care	Yes No Comment #
Notes / Comments		
NONE		
	•	
Preliminary PFAR(s)? Yes	No Preliminary F	PFAR Number(s):
Clarification Form(s)? Yes	No Number of F	orms Attached:
REVISION	DOC 1	NO. TWR-64240 VOL PAGE A-61



Case Factory Joint - ET Attach/Stiffener

Motor No.: RSRM-32	Side: Left (A)	Date: 9 - 1 - 7 - 3		
Assessment Engineer(s)/Inspector(s):				
Joint Seals and Metal:  a. Heat affected or eroded Obb. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in Note: Remove corrosion to determ	ring? i joint?	Yes No Comment #		
hardware. Solvent and/or g	reen Scotch-Brite <sup>®</sup> pads may be us circumferential direction only.	ed to remove the corrosion. Corrosion		
Notes / Comments				
	·			
Preliminary PFAR(s)? Yes	No Preliminary PFAF	R Number(s):		
Clarification Form(s)? Yes	No Number of Form	s Attached:		
revision	DOC NO.	TWR-64240 VOL PAGE A-62		



Case Factory Joint - Stiffener/Stiffener

Motor No.: RSRM-32	Side: Left (A)	Date: 4	9-1-93		
Assessment Engineer(s)/Inspector	(s): 6 RICH				
Joint Seals and Metal:  a. Heat affected or eroded O- b. Heavy corrosion (pitting) ir c. Heavy corrosion (pitting) ir	n joint? n leak check port?	Yes	No Comment #		
hardware. Solvent and/or g	Note: Remove corrosion to determine if pitting has occurred. Care should be taken not to damage the hardware. Solvent and/or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only.				
Notes / Comments					
,					
Preliminary PFAR(s)?Yes	S No Preliminar	y PFAR Number(s	):		
Clarification Form(s)? Yes	No Number of	Forms Attached:			
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Case Factory Joint - Aft Dome

Motor No.: RSRM-32	Side: Left (A)	Date: 09.	01.93
Assessment Engineer(s)/Inspector	(s): Schenck		
Joint Seals and Metal:  a. Heat affected or eroded Ob. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	ring? n joint? n leak check port?	Yes No	
	nine it pitting has occurred. Care  reen Scotch-Brite <sup>®</sup> pads may be circumferential direction only.		
Notes / Comments		, .,	
Preliminary PFAR(s)? Yes		FAR Number(s):	
Clarification Form(s)? Yes	No Number of Fo	orms Attached:	
REVISION	DOC N	1	VOL 1-64



## POSTFLIGHT OBSERVATION RECORD (PFOR) S&A Device (Barrier-Booster and Environmental Seal Regions)

Motor No.: RSRM-32	Side: Right (B)	Date: 7 9 93
Assessment Engineer(s)/Inspector	(s): Eden/Nolan	
Barrier-Booster Bore and Rotor:  a. Soot to or past O-rings? b. Sooted metal surfaces? c. Heat affected or eroded O- d. O-ring damage (installed)? e. Foreign material? f. Heat affected or eroded m g. Metal damage? h. Excessive grease? i. Corrosion? j. Teflon retainer damage?  Environmental Seal Regions: k. Environmental O-ring asser (visible without magnification).	-ring (installed)? netal?	Yes No Comment #
Notes / Comments  D Typical pressure Sooting.	to primary 0-ring & 1	- with associated
Preliminary PFAR(s)?Yes	s No Preliminary PFAI	R Number(s):
Clarification Form(s)? Yes	s No Number of Form	ns Attached:
REVISION	DOC NO.	TWR-64240 VOL



## POSTFLIGHT OBSERVATION RECORD (PFOR) S&A Rotor Shaft O-rings (Detailed)

Motor No.: RSRM-32	Side: Right (B)		Date:	7	9	93
Assessment Engineer(s)/Inspector(	(s): Eden/No	olan			7	
Forward Primary O-ring:  a. Heat affected or eroded O- b. O-ring defects/damage?	ring?		es 		lo /	Comment #
Aft Primary O-ring:  c. Heat affected or eroded O- d. O-ring defects/damage?	ring?	<del></del>		<u>`</u>		
Forward Secondary O-ring:  e. Heat affected or eroded O- f. O-ring defects/damage?	ring?	_			/	
Aft Secondary O-ring: g. Heat affected or eroded O-h. O-ring defects/damage?	ring?				/	
Notes / Comments						
Preliminary PFAR(s)? Yes	No Pro	eliminary PFAR Nu	mber(s)	:		
Clarification Form(s)? Yes	No Nu	mber of Forms Att	ached:			
REVISION		DOC NO. TV	VR-6424	0 PAGE		VOL -66



Sil and Port (At Removal) - 18 Degrees

Motor No.: RSRM-32	Side: Right (B)	Date: 7)9/	73
Assessment Engineer(s)/Inspector	(s): Eden/Nolan	\	
sil and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Eroded metal? f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion. i. Metal damage?	ring (installed)?	Yes No	Comment #
Notes / Comments	- nd		
typical sout to the	2" thread and	tip of SII.	
•			
•			
•			
	•		
			•
Preliminary PFAR(s)? Yes	No Prelimina	ary PFAR Number(s):	
Clarification Form(s)? Yes	No Number	of Forms Attached:	
REVISION		DOC NO. TWR-64240 VO. SEC PAGE A-67	<del></del>



SII and O-rings (Detailed) - 18 Degrees

Motor No.: RSRM-32	Side: Right (B)	Date:	7/9/93
Assessment Engineer(s)/Inspector	(6): Feden/No	lan	
Sil:  a. Foreign material between to b. Eroded metal? c. Seal surface/thread damage	-	Yes	No Comment #
Primary O-ring:  d. Heat affected or eroded O- e. O-ring defects/damage?	ring?		
Secondary O-ring:  f. Heat affected or eroded O- g. O-ring defects/damage?	ring?	<del></del>	
Notes / Comments			
Preliminary PFAR(s)? Yes	No Prelii	minary PFAR Number(s)	•
Clarification Form(s)?Yes	No Num	ber of Forms Attached:	
REVISION		DOC NO. TWR-6424	0 VOL



SII and Port (At Removal) - 198 Degrees

Motor No.: RSRM-32	Side: Right (B)	Date: 7/9	193
Assessment Engineer(s)/Inspector(	(s): Eden/Nolar	<u> </u>	
Sil and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Eroded metal? f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion. i. Metal damage?		Yes No	Comment #
Notes / Comments			
1- Typical soot to	tip of SII.		
Preliminary PFAR(s)? Yes	No Prelim	inary PFAR Number(s):	
Clarification Form(s)? Yes	s <u>V</u> No Numbe	er of Forms Attached:	
REVISION		DOC NO. TWR-64240 V	OL 59



SII and O-rings (Detailed) - 198 Degrees

Motor No.: RSRM-32	Side: Right (B)	Date: 7)9)	93
Assessment Engineer(s)/Inspector(s): Eden Nolan			
SII:  a. Foreign material between the b. Eroded metal?  c. Seal surface/thread damage	he O-ring and SII?	Yes No	Comment #
Primary O-ring:  d. Heat affected or eroded O-ring defects/damage?	ring?		
Secondary O-ring:  f. Heat affected or eroded O-ring defects/damage?	ring?		
Notes / Comments			
Preliminary PFAR(s)? Yes No Preliminary PFAR Number(s):			
Clarification Form(s)? Yes No Number of Forms Attached:			
REVISION		DOC NO. TWR-64240 VOI	



### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Metal Components – Excluding Joints

Motor No.: RSRM-32	Side: Right (B)		Date: 93	501,73
Assessment Engineer(s)/Inspector	(s): J. Passman, K	2. Quíc	k, M.C	lark
Metal Component (check appropri	iate space when evaluation is	completed	):	
Forward Ex	xit Cone Housing		Flexible Bearin	g
Fixed House	sing		Throat Housing	ı
Cowl Hous	sing		Nose inlet Hou	sing
Metal Components:		```	res No	Comment #
a. Metal damage?				-
b. Loose or missing fasteners	s?		<u> </u>	<del></del>
(including forward exit con				
c. Heat affected paint (discol	ored and blistered)?			
d. Bubbled paint?				<del></del>
f control of the cont	t due to impact or handling?			<del></del>
f. Heavy corrosion?				,
Notes / Comments				
Preliminary PFAR(s)? Ye	s No Prelimin	ary PFAR N	umber(s):	
Clarification Form(s)?Ye	s No Number	of Forms A	Attached:	
REVISION	· ·	DOC NO. T	WR-64240	vol



Nozzle Internal Joint RTV - Joint 2

Motor No.: RSRM-32	Side: Right (B)	Date: 9 JULY 93
Assessment Engineer(s)/Inspector(s	B): J. PASSMAN R. QU	uck
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backf  f. Foreign material?		Yes No Comment #
Notes / Comments		ACCEPTED RECVEILL
Special Issue 3.3.4 NO AB	NORMAL CONDITIO	CNS CBSERVED, BACKFILL
NAS E	XCEPIIONAL.	
	·	
		•
Preliminary PFAR(s)? Yes	No Prelimi	nary PFAR Number(s):
larification Form(s)? Yes	No Numbe	r of Forms Attached:
REVISION		DOC NO. TWR-64240. VOL SEC PAGE A-72



Nozzle Internal Joint Phenolics - Joint 2

Assessment Engineer(s)/Inspector(s):  Joint Phenolics:  a. Heat affected or eroded CCP (below the char line), GCP/SCP, or adhesive?  b. Physical damage? c. Edge separations (metal-to-adhesive, within adhesive, adhesive-GCP/SCP, within GCP/SCP, GCP/SCP-to-CCP, or within CCP)? d. Phenolics axially displaced from the housing?  Notes / Comments  Preliminary PFAR(s)?  Yes No Preliminary PFAR Number(s):  Jarification Form(s)? Yes No Number of Forms Attached:	Motor No.: RSRM-32	Side: Right (B)	Date:		
Joint Phenolics:   a. Heat affected or eroded CCP (below the char line), GCP/SCP, or adhesive?	Assessment Engineer(s)/Inspector(s	s):	•		•
or adhesive? b. Physical damage? c. Edge separations (metal-to-adhesive, within adhesive, adhesive-GCP/SCP, within GCP/SCP, GCP/SCP-to-CCP, or within CCP)? d. Phenolics axially displaced from the housing?  Notes / Comments  Preliminary PFAR(s)?Yes	Joint Phenolics:		Yes	No 1	Comment #
C. Edge separations (metal-to-adhesive, within adhesive, adhesive-CP/SCP, within GCP/SCP, GCP/SCP-to-CCP, or within CCP/?  d. Phenolics axially displaced from the housing?  Notes / Comments  Preliminary PFAR(s)?  Yes  No  Preliminary PFAR Number(s):  Jarification Form(s)?  Yes  No  Number of Forms Attached:  SEVISION  DOC NO. TWR-64240  Vol.	or adhesive?	P (below the char line), GCP/SCP,			· · · · · · ·
adhesive-GCP/SCP, within GCP/SCP, GCP/SCP-te-CCP, or within CCP)?  d. Phenolics axially displaced from the housing?  Notes / Comments  Preliminary PFAR(s)?  Yes  No  Preliminary PFAR Number(s):  Jarification Form(s)?  Yes  No  Number of Forms Attached:  DOC NO.  TWR-64240  Vol.					
A. Phenolics axially displaced from the housing?  Notes / Comments  Preliminary PFAR(s)?  Yes  No  Preliminary PFAR Number(s):  Jarification Form(s)?  Yes  No  Number of Forms Attached:  DOC NO. TWR-64240  Vol.			<del></del>	<u> </u>	
Preliminary PFAR(s)? Yes V No Preliminary PFAR Number(s):	or within CCP)?			4	
Preliminary PFAR(s)?	d. Phenolics axially displaced f	irom the housing?		<u> </u>	
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL	Notes / Comments		<del> </del>		
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL	•				
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL	·				
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
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larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
larification Form(s)? Yes No Number of Forms Attached:  DOC NO. TWR-64240 VOL					
REVISION DOC NO. TWR-64240 VOL				):	
REVISION	Jarification Form(s)? Yes	No Number of For	ms Attached:		
SEC PAGE A-73	DC/ICON	DOC NO	TWR-642	40   voi	<u>-                                      </u>
	REVISION	SEC		PAGE A-73	

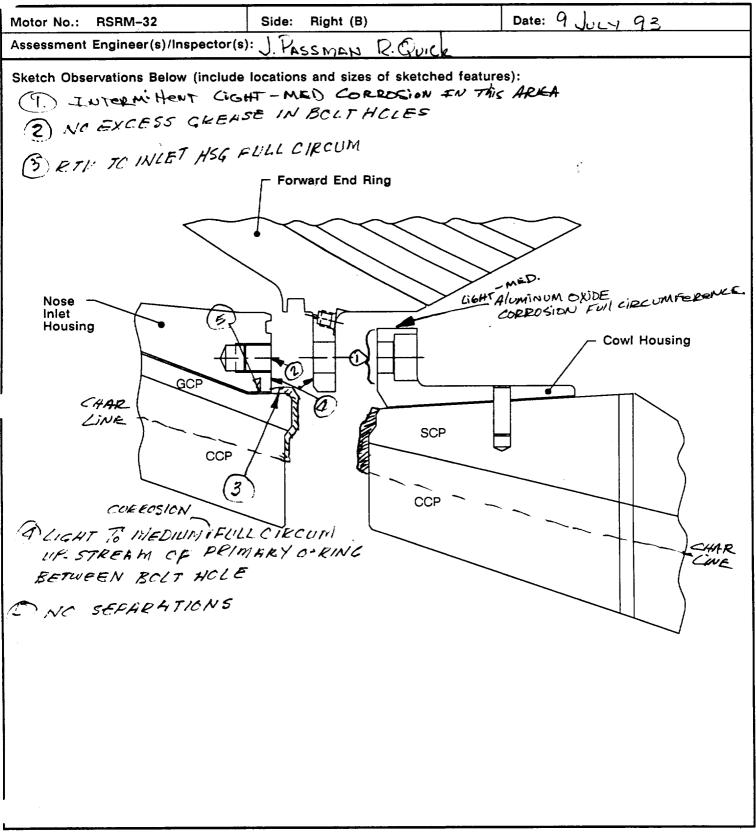


# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal - Joint 2

Motor No.: RSRM-32 Side: Right (B)	Date: 7- 9- 93
Assessment Engineer(s)/Inspector(s): W. Sperm . M. DE	Folter
Joint Seals and Metal:  a. Soot to or past O-rings? b. Sooted joint surfaces? c. Heat affected or eroded O-rings (installed)? d. O-ring damage (installed)? e. Heat affected or eroded metal? f. RTV to primary O-ring? g. RTV past primary O-ring? h. Foreign material? i. Excessive grease?   (including in threaded and through bolt holes) j. Metal damage?   (including index pin and bolt holes (through, threaded/helical coil inserts)) k. Bent or broken bolts?	Yes No Comment #
Notes / Comments	
1- light to medium conosion up stream of probable holes full circumference.	many 0-ring between
Preliminary PFAR(s)? Yes No Preliminary PF	AR Number(s):
Clarification Form(s)? Yes No Number of Form	rms Attached:
REVISION SEC	PAGE A-74



Nozzle Internal Joint Drawing Worksheet - Joint 2



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### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 2

Motor No.: RSRM-32	Side: Right (B)		Date: 7-9-93	
Assessment Engineer(s)/Inspector	(s): W. Speny	M. Offoller,	B. Ferguson	<b>\</b>
Primary O-ring:  a. Heat affected or eroded O-b. O-ring defects/damage?	, ,		/es No	Comment #
Secondary O-ring:  c. Heat affected or eroded Odd. O-ring defects/damage?	-ring?			
Notes / Comments				
Preliminary PFAR(s)? Ye	s No	Preliminary PFAR N	lumber(s):	
Clarification Form(s)?Ye	sNo	Number of Forms	Attached:	-
REVISION		DOC NO.	TWR-64240   VOL   PAGE A-76	····



Nozzle Internal Joint RTV - Joint 3

Motor No.: RSRM-32	Side: Right (B)		Date: 9 Unl	4 93
Assessment Engineer(s)/Inspector(s	): K. Guck L	N. SPERRY	P, MILLER,	,
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backfif. Foreign material?	ill?		Yes No	Comment #
Notes / Comments				
•				
		,		
·				
Preliminary PFAR(s)? Yes	No	Preliminary PFAI	R Number(s):	
Jarification Form(s)? Yes	No No	Number of Form	ns Attached:	_
REVISION		DOC NO.	TWR-64240 V	OL



Nozzle Internal Joint Phenolics - Joint 3

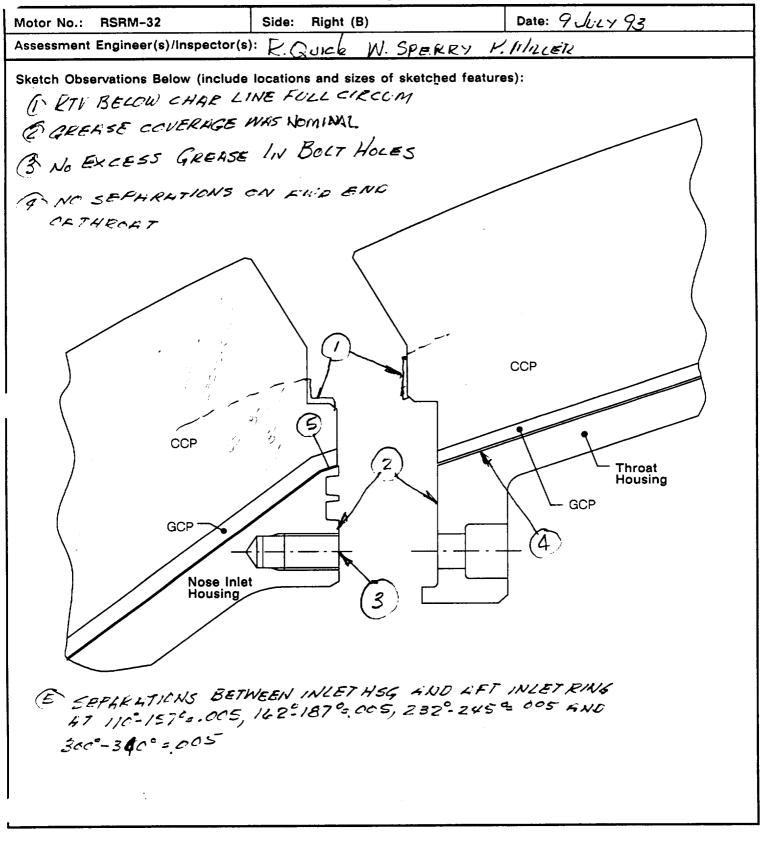
Motor No.: RSRM-32 Side: Right (B)	Date: 9 July 93
Assessment Engineer(s)/Inspector(s): E. Quick	W. SPERRY P. MILLER
Joint Phenolics:  a. Heat affected or eroded CCP (below the char or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive, within adhesive-GCP, within GCP, GCP-to-CCP, or with d. Phenolics axially displaced from the housing?	thesive, $\sqrt{{SEEFCA-8C}}$
Notes / Comments	
Preliminary PFAR(s)?Yes/_No	Preliminary PFAR Number(s):
larification Form(s)? Yes	Number of Forms Attached:
REVISION	SEC PAGE A-78



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal – Joint 3

Motor No.: RSRM-32 Side: Right (E	Date: /-9-95
Assessment Engineer(s)/Inspector(s): W. Sperm	M. Offolter
Joint Seals and Metal:  a. Soot to or past O-rings?  b. Sooted joint surfaces?  c. Heat affected or eroded O-rings (installed)?  d. O-ring damage (installed)?  e. Heat affected or eroded metal?  f. RTV to primary O-ring?  g. RTV past primary O-ring?  h. Foreign material?  i. Excessive grease?  (including in threaded and through bolt holes)  j. Metal damage?  (including index pin and bolt holes (through, helical coil inserts))  k. Bent or broken bolts?	
Notes / Comments	
Preliminary PFAR(s)?YesNo	Preliminary PFAR Number(s):
Clarification Form(s)? Yes No	Number of Forms Attached:
REVISION	DOC NO. TWR-64240 VOL. SEC PAGE A-79

Nozzle Internal Joint Drawing Worksheet - Joint 3



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Thickol CORPORATION SPACE OPERATIONS

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 3

Motor No.: RSRM-32 Side: Right (B)	Date: 7-9-93
Assessment Engineer(s)/Inspector(s): W. Sperm	M. Offolter B Ferguson
Primary O-ring:  a. Heat affected or eroded O-ring?  b. O-ring defects/damage?	Yes No Comment #
b. O-ring delects/damage:	
Secondary O-ring:  c. Heat affected or eroded O-ring?	
d. O-ring defects/damage?	
Notes / Comments	
-	
•	
Preliminary PFAR(s)?YesNo	Preliminary PFAR Number(s):
Clarification Form(s)? Yes No	Number of Forms Attached:
PEVISION	DOC NO. TWR-64240 VOL
REVISION	SEC PAGE A-81



### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint RTV - Joint 4

Motor No.: RSRM-32 Side:	Right (B)	Date: / JULY	43
Assessment Engineer(s)/Inspector(s):	QUICK A. CARLISLE	PHILLER	
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Grease inhibiting RTV backfill?  f. Foreign material?		Yes No / / / / / / / / / / / / / / / / / /	Comment #
Notes / Comments			
Preliminary PFAR(s)?Yes	/_ No Preliminary PF/	AR Number(s):	
Clarification Form(s)?Yes	No Number of For	ms Attached:	_
REVISION	DOC NO	D. TWR-64240 VOI	



Nozzle Internal Joint Phenolics - Joint 4

Motor No.: RSRM-32	Side: Right (B)	Date: 9 JULY 93
Assessment Engineer(s)/Inspector(s): R.Quick A. CARLISLE		P.MILLER
Joint Phenolics:  a. Heat affected or eroded CCI or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive-GCP, within GCP, d. Phenolics axially displaced for the separation of	adhesive, within adhesive, GCP-to-CCP, or within CCP)?	Yes No Comment #
Notes / Comments  1-GCP BROKE DURING	DISASSEMBLY FROM 90°	°-/35°
		CIECUMI MIAX GAR = .021
Preliminary PFAR(s)?Yes	No Preliminary PFAF	R Number(s):
Clarification Form(s)?Yes		ns Attached:
REVISION	DÓC NO.	TWR-64240 VOL PAGE A-82

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal – Joint 4

Motor No.: RSRM-32	Side: Right (B)	Date: 7 JULY	93	
Assessment Engineer(s)/Inspector(s): R. Quick A. CARLISLE P. MILLER				
Joint Seals and Metal:  a. Soot to or past O-rings? b. Sooted joint surfaces? c. Heat affected or eroded O-ri d. O-ring damage (installed)? e. Heat affected or eroded met f. RTV to primary O-ring? g. RTV past primary O-ring? h. Foreign material? i. Excessive grease? (including in threaded and t j. Metal damage? (including index pin and bol helical coil inserts)) k. Bent or broken bolts?	tal? hrough bolt holes)	Yes No	Comment #	
lotes / Comments  /- ETV TO PRIMARY	O-RING FEON1 45°	80° & 240° - 270°		
Preliminary PFAR(s)?Yes	No Preliminary	PFAR Number(s):		
Clarification Form(s)? Yes			OL	

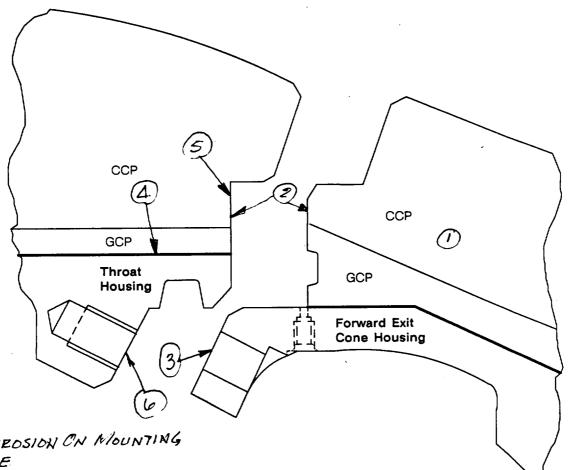


Nozzle Internal Joint Drawing Worksheet - Joint 4

Date: 7 JULY 93 Side: RSRM-32 Right (B) Motor No.: Assessment Engineer(s)/Inspector(s): P. Quick A. CARLIBLE P.MILLER

Sketch Observations Below (include locations and sizes of sketched features):

- PALL CHRBON MISSING EXCEPT FROM 1980-2650
- 2) RTV BELOW CHAR LINE FULL CIRCUM



- (3) NO CORROSION ON MOUNTING FLANGE
- 4) SEPARATION BETWEEN GBP & HOUSING FULL CIECUM
- E KTV DISCOLURED FROM SEA WATER FROM 198-2650
- 6 NO EXCESS GREASE IN

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SEC		PAGE A	-84

Thickol CORPORATION SPACE OPERATIONS

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 4

Motor No.: RSRM-32	Side: Right (B)	Date: 5 Th 183
Assessment Engineer(s)/Inspector	(s): A. Carlisle, B. Q	rick, N. Lyons, J Richards
Primary O-ring:  a. Heat affected or eroded O-b. O-ring defects/damage?	-ring?	Yes No Comment #
Secondary O-ring;  c. Heat affected or eroded O- d. O-ring defects/damage?	-ring?	
Notes / Comments		
	•	•
		•
Preliminary PFAR(s)?Ye	s No Prelimi	nary PFAR Number(s):
Clarification Form(s)?Ye	No Numbe	r of Forms Attached:
REVISION		DOC NO. TWR-64240 VOL  SEC PAGE A-85



Nozzle Internal Joint RTV - Joint 5

Motor No.: RSRM-32	Side: Right (B)	Date: & JULY 93	
Assessment Engineer(s)/Inspector(s	): R. QUICK A. CARLISLE	P. MILLER	
Joint RTV:  a. Gas penetration?  b. RTV not below char line?  c. Uncured/reverted RTV?  d. Voids within RTV?  e. Foreign material?		Yes No Comm	ent #
Notes / Comments  Truc SMALL WC/L	OS AT LOCATION 1400	ANE 32C°	
	·		
		,	
Preliminary PFAR(s)? Yes	· · · · · · · · · · · · · · · · · · ·	R Number(s):	
Yes	No Number of Form	ns Attached:	
REVISION	DOC NO SEC	TWR-64240 VOL PAGE A-86	

Thickol CORPORATION SPACE OPERATIONS

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Internal Joint Phenolics - Joint 5

Motor No.: RSRM-32	Side: Right (B)	Date: 8 JULY	193
Assessment Engineer(s)/Inspector(s	5): R. QUICK A. CARLISLE	D. MILLER	
Joint Phenolics:  a. Heat affected or eroded CCI or adhesive?  b. Physical damage?  c. Edge separations (metal-to-adhesive-GCP, within GCP, 6d. Phenolics axially displaced for a separation of the separation of	adhesive, within adhesive, GCP-to-CCP, or within CCP)?	Yes No	Comment #
Notes / Comments	•		
Preliminary PFAR(s)?Yes	No Preliminary PF	FAR Number(s):	
arification Form(s)?Yes	No Number of Fo	rms Attached:	<u></u>
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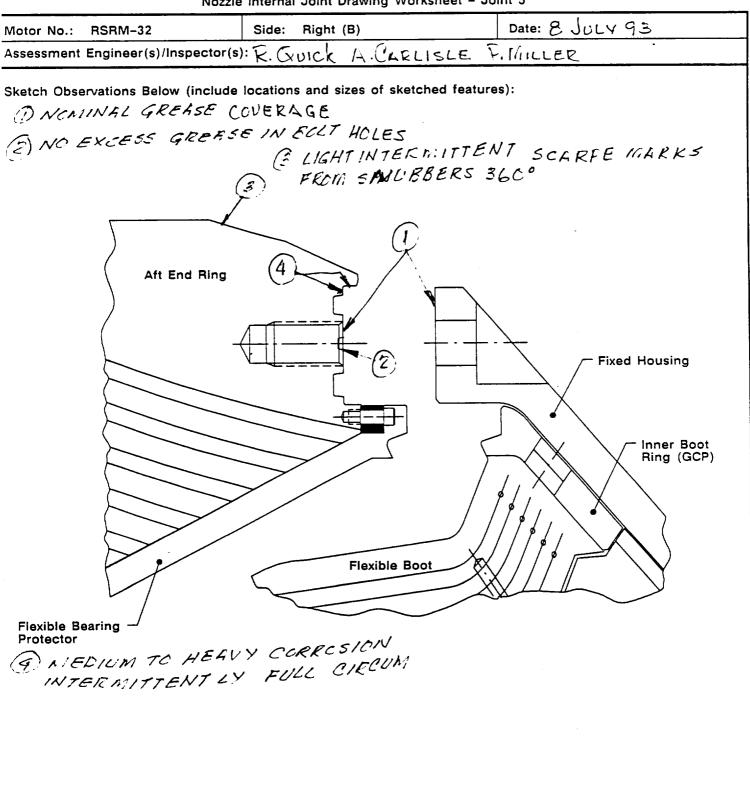
### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Seals and Metal - Joint 5

	Wozzie internar John Seals	The motal - control	1
Motor No.: RSRM-32	Side: Right (B)	Date:	8 JULY
Assessment Engineer(s)/Inspecto	r(s): P. Quick P. Mil	LER A. CARLIS	
Joint Seals and Metal:		Yes	No Comment #
a. Soot to or past O-rings?			
b. Sooted joint surfaces?			
c. Heat affected or eroded (	O-rings (installed)?	<del></del>	
d. O-ring damage (installed)	?		
e. Heat affected or eroded r			
f. RTV to primary O-ring?			
g. RTV past primary O-ring?			
h. Foreign material?			
i. Excessive grease?			
(including in threaded and	d through boit holes)	<del></del> -	,
j. Metal damage?	<u>-</u>		
	oolt holes (through, thread	led/	
helical coil inserts))			
k. Bent or broken bolts?			
	1		
Proliminary PFAR(s)?Y	es <u> </u>	iminary PFAR Number	(s):
		nber of Forms Attache	d:
· · · · · · · · · · · · · · · · · · ·		· · · ·	
		DOC NO. TWR-6	4240 VOL

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Nozzle Internal Joint Drawing Worksheet - Joint 5



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# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint O-rings (Detailed) - Joint 5

Motor No.: RSRM-32	Side: Right (B)		Date: & July 1	993
Assessment Engineer(s)/Inspector	(s): A. (arlist	e, W. Fergusc	)Λ	
Primary O-ring:  a. Heat affected or eroded O- b. O-ring defects/damage?	ring?	- -	Yes Mo	Comment #
Secondary O-ring:  c. Heat affected or eroded O- d. O-ring defects/damage?	ring?			
Notes / Comments				
		-		
		•		
	1			
Preliminary PFAR(s)? Yes	sNo	Preliminary PFAR	Number(s):	
Clarification Form(s)?Ye	s/_ No	Number of Forms	Attached:	_
REVISION	•	DOC NO.	TWR-64240 VOL	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Packings With Retainers (Detailed) - Joint 5

Motor No.: RSRI	л–32		ht (B)		Date: 🎸	July 199	3
Assessment Engin	eer(s)/Inspector(	s): A. Car	lisle, N. Lyo	ns, J. Ric	hards	, 	
b. Seal or ret	ainers: ed or eroded sea ainer defects/dar heavy corrosion	al or retainer nage?		,	∕es ✓	No .	Comment #
Notes / Comments	Typical disa	ssembly ru	bber damaye	to >2 of	>2 fack	clas with	Retainers
			-				•
				·			
Preliminary PFAR	(s)?Ye	s <u>/</u>	No Prelimir	nary PFAR N	lumber(s):		
Clarification Form	(s)?Ye	, <u>/</u> 1	No Numbei	of Forms A	Attached:		
REVISION	-			DOC NO.	FWR-64240	VOL AGE A-91	<del></del>



### Cowl Insulation Segments

Motor No.: RSRM-32 Side: Right (B)						ate: 9	JU/V	73
Assessment Engineer(s)/Inspector(s): Jim PASSMAN Bos Quick								
Cowl Insulation Segments:  a. Abnormal heat effect b. Soot between the co	owl segm	ent and co	owl housin	g/SCP?	Yes	; ! 	No /	Comment #
Bondline Failure Mode Perc	entage:			•				
	1 = 11	Jul - 90	10n - 12e		Location	lase 270	1020-315	1215 A
Metal-to-Adhesive	25	30	90-135	135-180	60	30	40	35-0
Within Adhesive	2	5	1	2	3	3	2	5
Adhesive-to-SCP	2	2	5	2	7	2	Z	Z
Adhesive-to-segment	71	63	53	46	30	65	56	33
Within segment								
Special Issue 3.3.3  THE COWL  CONDITION  WERE	JUS JOUND	NATION NBONDIN	SEGME	ENTS W	DERE; N NOMHOU	ekcelos S GOND	PENT DWS	
	Yes	<u></u>	No Pi	reliminary F	PFAR Num	ber(s):	·	<del></del>
Clarification Form(s)?	Yes	_U_N	lo N	umber of F	orms Atta	ched:		
REVISION				DOC	NO. TW	R-64240	VOL - A−92	



Flexible Bearing Protector, Flexible Bearing, and Flexible Boot

Motor No.: RSRM-32	Side: Right (B)	Date: 9 July 95	
Assessment Engineer(s)/Inspector(	s): Jim PASSMAN		
a. Abnormal bearing protector (including burn-through) b. Cracks through the bearing c. Soot between the bearing p d. Heat effects to the flexible e. Bent or broken bearing prof f. Flexible boot burn-through? g. Abnormal heat effects or er h. Foreign material in the boot	protector? protector and flexible bearing? bearing? tector bolts? rosion to flexible boot ID?	Yes No Comment #	
Notes / Comments			
F 'iminary PFAR(s)? Yes	No Preliminary I	PFAR Number(s):	
Clarification Form(s)?Yes	No Number of F	Forms Attached:	
REVISION	DOC	PAGE A-93	,



REVISION \_\_\_\_

Motor No.: RS	SRM-32 S	ide: Right (B)		Date:	14 JUL
	gineer(s)/Inspector(s	- 1 77	ISTERIOUS		
	Protector Gas Impin			nents (see figure	):
				, ,	
Degree	Thickness Measurement	Degree	Thickness Measurement	Degree	Thickness Measurement
Location	A* (inches)	Location	A* (inches)	Location	A* (inches)
0	<u>• 718</u>	120	728	240	_,23/_
10	<u>, 7,2,2</u>	130	• 7/5	250	.654
20	1227	140	<u>-7/8</u>	260	.735
30	<u> 730.</u>	150	. 7.25	270	· 7,25
40	7.52	160	<u>· 72/</u>	280	· 75C
50	1733	170	1333	290	<u> </u>
60	235	180	- 7.26	300	<u> </u>
70	<u> , 737</u>	190	775	310	169
. 80		200	<u>. 7.30 </u>	320	<u> </u>
90	1725	210	165	330	722
100	- C98 .	220	<u>-730</u>	340	71.5
110	163	230	· 23~	350	<u> </u>
THE A	Belly Band	beli to ti	'A" is the minimum y band in-line with t he deepest gas imp	the cowl vent ho	les. It corresponds
lotes / Comme		· · · · · · · · · · · · · · · · · · ·			
	-				



REVISION \_\_\_\_

#### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzie Throa	t Diameter Measurements (Data Colle	ction Only)
Motor No.: RSRM-32	Side: Right (B)	Date: 07-12-93
Assessment Engineer(s)/Inspector(s):	MIGHEL ENRIGHEZ, RICK	GALLEGES
Nozzle Throat Diameter Measurement	• s:	
	Diameter Measurement (inches)  0	·
Notes / Comments		
Avg. Thr	oat Diameter = 5:	5925*
Ularification Form(s)?Yes	No Number of Forms	Attached:
	DOC NO.	TWR-64240 VOL

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SEC



Nozzle	Phenolic	Bondline	_	Aft	Exit	Cone	Assembly
--------	----------	----------	---	-----	------	------	----------

Motor No.: RSRM-32		Side: Ri	ght (B)	· · · · · · · · · · · · · · · · · · ·		Date: 💍	y uly	73
Assessment Engineer(s)/Ins	pector(s)	E. Gu	ick /	F. MILL	er_	- ··-	, ,	
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?							Comment #	
Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.								
Primary Bondline/Phenolic F	ailure M	ode Percer	ntage (Afte	er Hydrolas	se and We	dge Remo	oval):	
	c-45	145-96	196-135	Degree   135-180	Location   180 - 225	225-270	270-315	315-0
Metal-to-Adhesive		2%	5%					
Within Adhesive				·				
Adhesive-to-GCP				,			ļ	
Within GCP	160%	98%	95%	100%	100%	100%	100%	100%
GCP-to-CCP								
Within CCP								
Secondary Bondline Failure	Mode Pe	ercentage (	After Rem		emaining F Location	Phenolics)	: 	
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								
Phenolic Removal N	Method:				-			
Notes   Comments  -1010 22.   FROM FWD END 1.14×14L ×, & CIRCON & LOC 198° 2- 5MALL 1010S IN FOLY SULFIDE FULL CIRCUM								
Preliminary PFAR(s)?	Yes	<u></u>	No P	reliminary	PFAR Nur	nber(s): _		
Clarification Form(s)?	Yes	<u></u>	No N	umber of	Forms Att	ached: _	•	
REVISION				SEC	<del> </del>	VR-64240	VOL GE A-96	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Forward Exit Cone Assembly

Motor No.: RSRM-32		Side:	Right (B)			Date: 1	- 14 - 9		
Assessment Engineer(s)/Insp	ector(s	): M. (	love D	M. Ne	٢		<u></u>		
Metal Housing Bondline Surface:  a. Soot? b. Heat affected or eroded metal? c. Voids in adhesive greater than 0.5 inch in any direction? d. Corrosion? e. Foreign material?  Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.									
Primary Bondline/Phenolic Fa	ailure M	ode Perc	entage (Afte	er Hydrola	se and We	dge Remo	oval):		
l <sub>i</sub>	18718 <u>.</u> 22.5		5 645-112.5		e Location د المدرة //57,5	2025-247.	247.5 - 292.5	292.5- 387.5	77.6
Metal-to-Adhesive	30	45	40	30	65	25	15	45	55
Within Adhesive					ļ		_		
Adhesive-to-GCP	70	175	60	70	35	80	25	55_	
Within GCP									
GCP-to-CCP									<u> </u>
Within CCP									<u> </u>
Secondary Bondline Failure I	Mode P	ercentage	(After Rem	noval of R	emaining	Phenolics)	:		
•					e Location				
	NA		1						]
Metal-to-Adhesive									
Within Adhesive									
Adhesive-to-GCP									
Phenolic Removal N	lethod:								
Notes / Comments /) Void - docume	intec	lang	oage A	-104A	and f	1-1048			
Preliminary PFAR(s)?	Yes				PFAR Nu				
Carification Form(s)?	Yes		_ No N	lumber of	Forms At	tached: 🗡	7-1041	1-104B	
REVISION					OC NO. T	WK-64240 PA	GE A-97		

Thickol CORPORATION SPACE OPERATIONS

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,)	Nozzie Subasse	embly Bondline Ad	hesive void Clarification Pe	,,,,,,
Motor No.: RSRM -	32	Side: 🔲 Left (A	Right (B) Date:	7-19-93
Assessment Engineer(	s)/inspector(s):	M. Clar	K. P. Miller	
Nozzle Subassembly:	Fud Exi	+ Cone		
Record Bondline Adhe	sive Void Measu	rements and Loca	tions Below:	
Degree	Void Siz	e	Location on Bo	1
Location	Axial	Circ.	Distance From Fwd	Distance From Aft
18.75	.7	.4		8.9
26.25	.7	,4	•	10.7
30	2.3	.6		6.9
31.9	1.4	,4		11.8
22.75	2.7	. 7		7.7
	.7_	,3		16.2
<u>045</u>	. 8	.3		17.0
<u> 59.5</u>	1.9	9		21.5
<u> 54.3</u>	.9	. 4		<u>2c.3</u>
65.6		.6		30.7
69.4		.4	<del></del>	5.4
16.9	.6	. 2		17.4
11.9		. 4		22.9
Notes / Comments	<u>.                                    </u>			
				ORIGINAL PAGE IS OF POOR QUALITY
			0	Number(s):

Thickol CORPORATION SPACE OPERATIONS

REVISION \_\_\_\_

<u> </u>	Nozzie Subas	sembly Bondline A	dnesive void Clarification Porf	Π
Motor No.: RSRM'-	32	Side: 🔲 Left (	A) X Right (B) Date:	1-19-93
Assessment Engineer(	s)/inspector(s)	: M. Clark	P.Miller	
Nozzle Subassembly:	FWLE	xit Conc		
Record Bondline Adhe	sive Void Mea	surements and Loc	cations Below:	
Degree	Void S	lize	Location on Bond	ling Surface
Location	Axial	Circ.	Distance From Fwd	Distance From Aft
123.8	3.6	. 4		14.9
127.5	6	.4		9.7
127.5	5.4	2.2		22.9
129.4	1.7	.9	<del></del>	21.6
221.3	- 9	_ , 5		<u>21./</u>
155.8	_5			<u>33.0</u>
signed, 4	1.5	_ , 4/		15.1
24c.3	16	_, 4/		31.6
277.5	1.1			<u>30,4</u>
279.4	1 (	,5		21.4
<u> </u>		,6		<u> 30.7</u>
	<del> </del>			
Notes / Comments				<del></del>
				OF POOR QUALITY
				POOR OF THE
			•	TOAL/17
			Corresponding Comment Nu	
	-			

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### POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Throat Assembly

		-							
Motor No.: RSRM-32		Side: Ri	ight (B)			Date: 2/			
Assessment Engineer(s)/Ins	pector(s)	: Jim	+25	Sonar	TRE	JUR F	RESTO	ow	
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  Yes  Comment #  (1)									
d. Corrosion?								_	
e. Foreign material?								_	
Note: Axial cuts may be rel	Note: Axial cuts may be relocated + or - 10 degrees only. Document if any cuts were relocated.								
Primary Bondline/Phenolic F	ailure Mo	de Percer	ntage (Afte	r Hydrola	se and We	edge Rem	oval):		
	- 116	VIC -00	104 12.00		Location		1212-315	וריניקר. זיין פו	3-th 1
Metal-to-Adhesive	0-47	99			90 225	100	100	315-360	99.6
	100	177	100	100	18	100	100	100	17.6
Within Adhesive		<del>                                     </del>			7				.4
Adhesive-to-GCP					Z	<u> </u>	-		• (
Within GCP									
GCP-to-CCP			<u> </u>				-		
Within CCP				<u> </u>	<u> </u>				
Secondary Bondline Failure	Mode Pe	rcentage (	(After Rem				:		
	ı	1	A/	Degre	e Location	· ·	1	}	
Metal-to-Adhesive		<del>                                     </del>	<i>'</i>						
Within Adhesive		+	1	A			<del> </del>		
Adhesive-to-GCP			<del>                                     </del>			-	-		
Adriesive-to-GCF			<u> </u>	<u> </u>	<u> </u>	.l			J
Phenolic Removal !	Method:			<u> </u>	· <del></del>				
Notes / Comments (1) NEIMEROUS SAI	311 Vei	is ~.	20 D	A INTE	en Hevi	TH THR	WEHOUT	Budlin	K.
(2) MEDIUM-LIGHT	T COR	2055101 YT 12'	VON,	END.	"FROM	1 FWQ	END	MEO-	
Preliminary PFAR(s)?	Yes	N	No Pr	eliminary	PFAR Nun	nber(s): _			
Clarification Form(s)?	Yes	1/1	No Ni	umber of	Forms Atta	ached: _			
REVISION			,	SE		VR-64240	VCL 3E A-98		



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline - Forward Nose and Aft Inlet Rings

Motor No.: RSRM-32		Side: Ri	ght (B)			Date: 7-	22-93	·
Assessment Engineer(s)/Ins	pector(s)	R.QU	ick -	T. FRES	TON			<del>-</del>
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?  Note: Axial cuts may be relocated + or - 10 degrees only. Docum					cuts were	Z relocated	Comment #	
				Degree	Location	•		
	0.45	145-90	90-135			225-270	270-315	312-0
Metal-to-Adhesive	70%	100%	100%	100%	100%	100%	100%	100%
Within Adhesive								
Adhesive-to-GCP	36%	<u> </u>						
Within GCP	10				<u> </u>			
GCP-to-CCP						<del> </del>		
Within CCP	<u></u>							
Secondary Bondline Failure	Mode Pe	ercentage (	After Rem		emaining I		:	
Metal-to-Adhesive								
Within Adhesive								
Adhesive-to-GCP								
Phenolic Removal I								
Notes / Comments THE 30 NO VO Special Issue 3.3.7	0% REI	MAINING EATER :	ADHE: THAN . 2	sivE Wa 5ø	S ON TA	4E AFT I	NLET RI	ING AREA
1. SEE PG A-10	>6 A							
2. MEDIUM TO HEA		,					UM	
Preliminary PFAR(s)?	Yes		No Pi	reliminary	PFAR Nur	mber(s):		
Clarification Form(s)?	/_Yes		No N	umber of	Forms Att	ached: 🗡	<u>1-106</u> L	7
REVISION				DO		WR-64240	VOL 3E A-99	

Thickol CORPORATION SPACE OPERATIONS

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#### Nozzle Subassembly Bondline Adhesive Void Clarification Form

Motor No.: RSRM	·-32	Side:  Lei	ft (A) 🛛 Right (B)	Date: 7/22/93
		·	K T. FRESTON	
Nozzie Subassembly			K I. FEESIUN	
Record Bondline Ad	hesive Void Mea	surements and	Locations Below:	
Degree	Void S			on Bonding Surface
Location	Axial	Circ.	Distance From Fwd	Distance From Aft
125	<u> 1.18</u>	.46	.43	
275	1.42	90_	2.00	
	<u> </u>			
·				
·	<del></del>	<del></del>		
		<del> </del>		
	<u></u>			<del></del>
			<del></del>	
			<del> </del>	•
	<del></del>			
**************************************				
Notes / Comments				
·				
أن الما الما الما الما الما الما الما الم			Corresponding Comr	ment Number(s):
	-		-	
			700 NO T	WE- (-4.240 VO)



Nozzie Phenolic Bondline - Nose Cap

								· · · · · · · · · · · · · · · · · · ·	
Motor No.: RSRM-32		Side: Rig	ght (B)			Date: 7/	22/93	<u> </u>	
Assessment Engineer(s)/Inspe	ector(s):	R. QU	uch	T. FRE	STON				
Metal Housing Bondline Surfa a. Soot? b. Heat affected or erode c. Voids in adhesive great d. Corrosion? e. Foreign material? Note: Axial cuts may be relo	ed metal ater than	0.5 inch i or – 10 de	grees only	. Docum		cuts were	relocated	Comment	#
				Dograd	Location				
1.	1-45	45-90	96-135	_		225-270	270-315	315-0	1
Metal-to-Adhesive	<u></u>	75 /-	,,,,,,,	700-700_	,00				
Within Adhesive				•					
Adhesive-to-GCP									
Within GCP	- J	1			10.0/		100%	100%	·
GCP-to-CCP	100%	100%	100%	100%	100%	100%	100/8	100/6	-
Within CCP		1							]
Secondary Bondline Failure Metal-to-Adhesive		45= 90	90-135	Degree	Location 180-225	225-276		1 4/	Total 39
Within Adhesive		1 -0/	-5 0/	1.0/		1,-01	1,00/	1001	
Adhesive-to-GCP	60%	65%	50%	60%	65%	65%	60%	65%	]61
Phenolic Removal M	lethod:	NYLO	N WE	DGE					_
Notes / Comments / MEDIUM TO MEDIUM Special Issue 3.3.7	2°6.5FR	OM AFI 1.	OAXIAL X	.18 <i>CIRU</i> I	M 128° 2	3.1 FROM	AF1 .701	AXIALX4	S CIECUM
145214.55 FROM AFTX. 45 Special Issue 3.3.12 M					20M AFTX	,45"AXIA	4 K. Z8 C	1245	תמו סע
Preliminary PFAR(s)?		N			PFAR Num	nber(s):			
Clarification Form(s)?	Yes	N	lo Nu	ımber of F	Forms Atta	ched: _/	<u> </u>	-107A)	
REVISION				DO		VR-64240	VOL BE A-100		

### PFOR CLARIFICATION FORM General

Motor No.: RSRM-32	Side: Lef	t (A) Y Right (B	) Date: 7	-22-93					
Assessment Engineer(s)/Ins	pector(s): 2. Quic		<u> </u>						
Description: LDI Dataskeet									
Sketch Observations Below (include locations and sizes of sketched features):									
NOSE CAP TO HOUSING BONDLINE (Right Hand)									
Degree Location Recorded Actual	Distance <sup>1</sup> Recorded Actu	Void or nal <u>Repair</u>	Axial Length	Circ. Width	Other <u>Info.</u>				
32 128 145 212 <u>208</u> 245	8.10 4.50 <i>B</i> .	5* Void 3* Void 55* Void 70* Void	1,00 .70 .45 ,45	1.80 .45 .26 .28	Nothing Found				
NOSE CAP TO FNR BONDLINE (Right Hand)									
Degree Location Recorded Actual	Distance <sup>2</sup> Recorded Actu	Void or <u>ual Repair</u>	Axial <u>Length</u>	Circ. Width	Other Info. NOTHING				
182	1.14				FOUND				
Distance from fwd tip of nose cap glass  Distance from flame surface  Distance from FNR - nose cap - housing interface  * MEASURED From AFT END OF NOSE CAP									
					-				
				•					

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REVISION \_\_\_\_



Nozzle Phenolic Bondline - Cowl Assembly

Motor No.: RSRM-32		Side: R	ight (B)			Date: 7	121/9	3	
Assessment Engineer(s)/Insp	pector(s	): Jin	n PASSI	MAN,	TREU	OR F	RESTUR	<u> </u>	
Metal Housing Bondline Surface:  a. Soot?  b. Heat affected or eroded metal?  c. Voids in adhesive greater than 0.5 inch in any direction?  d. Corrosion?  e. Foreign material?					Yes	s !		Comment	# 
Note: Axial cuts may be rei								d.	
Primary Bondline/Phenolic F	ailure M	ode Percei	ntage (Afte	er Hydrolas	se and We	dge Rem	oval):		
	سرود	<i>وو</i> سال	149 175		Location		177:43.5	عربور سروا	1 <i></i>
Metal-to-Adhesive	0-45	45-90	25	30	3	25210	50	315-30	14
	<u> </u>	-	1 20				30	12	
Within Adhesive	98,	99	75	70	95	98	50	98	] ! <i>85.5</i>
Within SCP	2	3131	13	10	2	10		10	0.5
SCP-to-CCP					30				
Within CCP						-		1	1
Secondary Bondline Failure  Metal-to-Adhesive	Mode P	ercentage	(After Rem		- Location		<u> </u>		-
		-	1			-	<del> </del>		-
Within Adhesive		1	A						
Adhesive-to-SCP	<u> </u>		10 (	<u> </u>					_
Phenolic Hemoval I									<b>-</b>
Notes / Comments ADHO	SIVE T	O META	L FAIL	PB WE	ee loca	TED A	TSHIN	ns on	
Special Issue 3.3.7	to up	ids We	ERE Z	DUND.					
Special Issue 3.3.13 BONDINE WAS IN GOOD SHAPE, VERY IOW ADDRESIVE TO  METAL FAILURE (1493); 8590 ADHOSIVE TO SCP.  Preliminary PFAR(s)?YesNo Preliminary PFAR Number(s):									
Clarification Form(s)?	Yes		No N	umber of	Forms Att	ached: _			
REVISION	,			DO SEG		WR-64240	VOL GE A-101		



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Bondline – Fixed Housing Assembly

Motor No.: RSRM-32		Side: Ri	ght (B)			Date: 7	-15-9	3	
Assessment Engineer(s)/Ins	pector(s)	: M.C	Jark.	DW.	iller				
Metal Housing Bondline Surface:  a. Soot? b. Heat affected or eroded metal? c. Voids in adhesive greater than 0.5 inch in any direction? d. Corrosion? e. Foreign material?									
Note: Axial cuts may be rel Primary Bondline/Phenolic F								ed.	
				Degree	Location				
	0-45	14590	190-125	_			0210-31	5 315-360	<u></u> .
Metal-to-Adhesive									-
Within Adhesive									
Adhesive-to-GCP									-
Within GCP	100	100	100	160	100	1/^_	12	100	-
GCP-to-CCP						<u> </u>			-
Within CCP									
Secondary Bondline Failure	Mode Pe	ercentage (	After Rem				):		
	I	1	I	Degree 	Location	I	1	1	Total
Metal-to-Adhesive		12							/ /
Within Adhesive								•	
Adhesive-to-GCP	98	58	100	100	100	100	100	100	99
			c5 ( +		<del></del>	1.7.		<u> </u>	_
Phenolic Removal N	Method:	WE(	549	CALITIE					<b>-</b>
Notes / Comments  / Titer ni	Heret	· void	Js, C	.30"	or 501	nalle	2.		
		. ,							
Preliminary PFAR(s)?	Yes		No Pr	eliminary	PFAR Nur	nber(s): _			
Clarification Form(s)?	Yes	N	No Nu	ımber of i	Forms Att	ached:			
REVISION				DOG		WR-64240	VOL GE A-102		

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### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Phenolic Sections - Aft Exit Cone

	gineer(s)/Inspector(s	): M. Clark				
		14.00	· · · · · · · · · · · · · · · · · · ·			
enolic Sectio			Y	'es	No C	Comment #
•	y cracking in virgin i	material?				
b. Ply liftin	gr			<u> </u>		
t Exit Cone C	har and Erosion Mea	surements:				
Station	0°	90°	18	0°	2	70°
Location	Erosion Char	Erosion Char	Erosion	Char	Erosion	Char
73.77	NA NA	NA NA	NA	NA	NA	_ <i>[\] \</i>
77.77						
83.77						
89.77						
95.77	<u> </u>					
101.77	0.17 0.61	0.19 0.55				4
107.77	NA NA	0.17 0.58			0.21	0.58
113.77		AU AU			NA	NA
118.77	<u> </u>	4 1	4	4	4	
Negative M	argin of Safety? _	Yes N	lo Station	n:	_ Degree:	
otes / Comme						
2) An inc from th	rease in the	erosron dept ation 107.77)	h was o	observe 1	ed at a	pprox.12"
) Special Issu	ue 3.3.18 All M	largins of Safet	y calculo	otions	were 7	positive.
Preliminary	PFAR Fly 1	largins of safet lifting was dos axial length on ad to the housi	erved	around	L the fo	11 circ.
57C-02 w	as the and	axial leigth on	the por	-tso-	that n	emained
Ply lifting	attach	ed to the housi	15 (torwar	rd 22 - 2	78 ). N	lone of
	the C	CP was recovere	d trom t	the at	t segnu	et. The
	P17 1;	fting is summar	ized on	page	D011-A	
eliminary PFA		•	inary PFAR Nu			2
arification Fo	rm(s)?/_ Yes	No Numbe	or of Forms A	ttached: A	-110A, A-1	10B, A-110C,
	103					, , , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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SEC

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Phenolic Sections - Aft Exit Cone

Motor No.: RSRM-32	Side: Right (B)	Date: 7-9-93
Assessment Engineer(s)/Inspector(s)	: M. Clark, T. Fre.	ston
Phenolic Sections:  a. Cross-ply cracking in virgin n b. Ply lifting?  Aft Exit Cone Char and Erosion Meas	Yes No Comment #	
Station	NA NA  0.19 0.56  NA NA C	rosion Char Erosion Char  VA NA NA  V V 0.16 0.54  0.11 0.59 0.12 0.60  NA NA NA  V V V D.16 NA NA  Station: Degree:
Notes / Comments		
Preliminary PFAR(s)?Yes	No Preliminary	PFAR Number(s):
Clarification Form(s)?Yes	No Number of I	Forms Attached:
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SPACE OPERATIONS

#### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Phenolic Sections - Aft Exit Cone

Motor No.: RSRM-32	Side: Right (B)	Date: 7-9-93	
Assessment Engineer(s)/Inspector(s)		T. Freston	
Phenolic Sections:  a. Cross-ply cracking in virgin n b. Ply lifting?  Aft Exit Cone Char and Erosion Meas			omment #
Station	2/0° Erosion Char  NA NA  O.18 O.56  NA NA  Ves No	255° Erosion Char Erosion  NA NA NA  V 0.19  0.34 0.49  0.16 0.55  NA NA NA  Station: Degree:	Char NA NA 0.59 NA 0.57 NA
Notes / Comments  Preliminary PFAR(s)?Yes	No Prelimin	ary PFAR Number(s):	
Clarification Form(s)? Yes	No Number	DOC NO. TWR-64240 VOL	
REVISION		SEC PAGE A-103 B	

### POSTFLIGHT OBSERVATION RECORD (PFOR)

Nozzle Phenolic Sections - Aft Exit Cone

		0.00
Motor No.: RSRM-32	Side: Right (B)	Date: 7-9-93
Assessment Engineer(s)/Inspector	(s): M. Clark, T. Fresto	n ·
Phenolic Sections:  a. Cross-ply cracking in virging b. Ply lifting?  Aft Exit Cone Char and Erosion More	material?	es No Comment #
Station 3 \( \sigma^\circ\)	28/1° 34	
Station 300° Location Erosion Char		Char Erosion Char
73.77 NA NA	<u> </u>	AU
77.77		
83.77		
89.77		
95.77		
101.77 0.18 0.5	7 0.20 0.57 6	<u>c</u>
107.77 0.20 0.5	<del></del>	0.62
113.77 0.21 0.5		<u> </u>
118.77 <u>NA NA</u>		
Negative Margin of Safety?	Yes No Statio	n: Degree:
Notes / Comments		
Preliminary PFAR(s)?Ye	es No Preliminary PFAR N	lumber(s):
Clarification Form(s)?Y	es V No Number of Forms	Attached:
REVISION	DOC NO.	TWR-64240 VOL
	SEC	PAGE A-103C

# PFOR CLARIFICATION FORM General

Motor No	.: RSRM-32		Side: Le	eft (A)	Right (B)	Date: 7-9-93	
Assessm	ent Engineer(s)	)/Inspector(	s): M. Cla	ark			
Description	on: AEC	PlyC	ifting				
Sketch Observations Below (include locations and sizes of sketched features):							
	RSRM-32B Aft DISTANCE	Exit Con• F	ly Lifting			* An increase in the amount of erosion was observed	
DEGREE 0	FROM FWD END 7 10 15	CHAR CAP 0.40 0.39 0.34 0.33	PLY LIFT 0.18 0.17 0.18 0.19	CHAR 0.10 0.09 0.08 0.06	VIRGIN CCP 0.46 0.43 0.41	at approx. Station 107.77 possible wash area intermittent around the Circumference.	
30	6 10 18	0.42 0.40 0.34	0.19 0.20 0.19	0.04	0.50 0.55 0.49		
60	7	0.40 0.41	0.13 0.15	0.00	0.57	Eroded Surface 7 *	
90	15 18	0.43	0.16 0.19	0.00	0.48	CHAR CAP	
165	6 10 15	0.37 0.42 0.40	0.16 0.18 0.18	0.00 0.00 0.00	0.54 0.52 0.50	CHAR PLY	
180	7 10 15	0.45 0.38 0.37	0.15 0.15 0.15	0.05 0.03 0.05	0.50 0.50 0.50	VIGINCEP	
195	7 10 15	0.40 0.40 0.39	0.14 0.15 0.18	0.00 0.00 0.00	0.55 0.55 0.53	GCP	
210	7 10	0.45	0.10 0.15	0.00	0.55 0.55		
255	6 10	0.37	0.2 0.18	0	0.54 0.52	AEC PHENOLIC CROSS-SECTION	
270	10 15 18	0.37 0.37 0.37	0.16 0.2 0.18	0 0 0	0.52 0.5 0.5		
285	6 10 15 18	0.42 0.42 0.40 0.40	0.15 0.15 0.15 0.17	0.00 0.00 0.00 0.00	0.52 0.53 0.54 0.50	Max. and Min. Values	
300	6 10 15 18	0.40 0.43 0.44 0.45	0.08 0.10 0.11 0.10	0.03 0.04 0.00 0.06	0.52 0.49 0.50 0.42		
330	10	0.37	0.16	0.00	0.53	No surface ply lifting was observed	
345	6 10 15	0.37 0.39 0.37	0.18 0.22 0.23	0.00 0.00 0.00	0.53 0.51 0.51	was observed	
l							

DOC NO.	TWR-64240	VOL
SEC	PAGE	- 103 D



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections - Forward Exit Cone

Motor No.: RSF	RM-32	Side: Right (E	3)	Date:	8-27-	93
Assessment Engi	neer(s)/Inspector(s)	: M. Clark				
b. Ply lifting	cracking in virgin n	Yes	No -	Comment #		
Station	0°	90°	•	180°		270°
Location	Erosion Char	Erosion (	Char Erosion	Char	Erosio	n Char
1.0				_		
4.0						
4.6						<del>-</del>
8.0					-	
12.0			$\rightarrow$ —		-	
16.0						
20.0						
24.0						
28.0					<u> </u>	
32.0					. —	
32.9		. <u> </u>	<del></del>			
34.0		. <del></del>		<del></del>	<u> </u>	- —
Negative Ma	rgin of Safety?	Yes	No Stat	ion:	Degree	o:
Notes / Commen	nts					
Very Su	vall section	on left a	Haded	ر مر (ن	dend	,
was n	of recove	ered at	wash.	No '	measi	rements
made	•					
Preliminary PFAI	R(s)?Yes	No	Preliminary PFAR	Number(s)	):	
larification For	m(s)? Yes	No	Number of Forms	Attached:		
REVISION _			DOC NO.	TWR-642	PAGE A-104	



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections – Throat Assembly

Motor No.: F	RSRM-32		Side: Right	(B)		Date:	8-26-	93
Assessment E			L.E. W			1 5555	<u> </u>	
Phenolic Secti	ons: ply cracking in ng?	ı virgin ma	iterial?			es	No Co	omment #
Station	0°	1	90	o .	180	)°	270	)°
Location	Erosion	Char	Erosion	Char	Erosion	Char	Erosion	Char
1.0	1.10	.64	1,11	,62	1.05	.64_	1,07	.68
2.0	1,10	.66	1.15	,66	1,07	,70	1.//	.6-
4.0	1.16	<u>,57</u>	1,18	<u>.67</u>	1,14	,59	1, 16	<u>.68</u>
6.0	1,21	<u>,57</u>	1,23	.66	1.20	.63	1,21	.67
8.0	1.19	,5 <u>B</u>	1,25	.61	1,23	.63	1,21	<u>,57</u>
10.0	1.18	.54	1,23	,65	1.16	·58	1,22	, 56
12.0	1.13	<u>,55</u>	1,19	,58	1.15	<u>.58</u>	1,18	<u>,58</u>
14.0	1.12	,56	1,17	.63	1,12	.59	1.17	.59
16.0	1.04	163	1.10	, <i>58</i>	1,15	63	1.09	.65
18.0	193	.64	.95	_,7/_	.93		.93	.75
20.0	.73	.76_	.74	.80	.75	78	.73	.81
22.0	.52	<u> ,72</u>	,50	<u>,83</u>	.49	.81	,55	.77
23.0	41	.78	.40	87	<u>.4/</u>	.79	.46	_81_
Negative 1	Margin of Safe	ety?	Yes _	No	o Station	n:	Degree:	
Notes / Comn	nents							
Preliminary P	FAR(s)?	Yes	No	Prelimi	nary PFAR N	umber(s):		
Clarification F	form(s)?	Yes	No	Numbe	r of Forms A	ttached:		
REVISIO	on				DOC NO.	FWR-6424	0 VOL	<del></del>



Nozzle	Phenolic	Sections	_	Forward	Nose	and	Aft	Inlet	Rings
HOLLIO		000							

Motor No.: RS	RM-32	Side: Right	t (B)		Date: ¿	3/26/93	
Assessment Eng	ineer(s)/Inspector(	i): CLARK, F.	PASSMAN, C	ruck. V	VILKES		
Phenolic Section	ns: cracking in virgin		,	. ,	es	No Co	omment #
Forward Nose Ri	ing Char and Erosic	n Measurement	ts:				
Station	<b>0</b> °	9	0°	180	D°	27	o°
Location	Erosion Char	Erosion	Char	Erosion	Char	Erosion	Char
28.0	<u> 1.07 .73</u>	1.04	.66	1.22	.66	1.//	.66
30.0	.90 .64	.80	.78	<u>.95</u>	.69	90	.65
32.0	.95 .60	.90	.65	.98	.59	.96	.56
Negative Ma	argin of Safety?	Yes	No	Station	n:	_ Degree:	
Aft Inlet Ring Ch	nar and Erosion Me	asurements:					
Station	0°	9	0°	18		27	70°
Location	Erosion Char	Erosion	Char	Erosion	Char	Erosion	Char
34.0	.84 .66	.85	.65	<u>.90</u>	.60	<u>.88</u>	<u>.53</u>
36.0	·86 ·64	.87	.7/	<u>.89</u>	.63	<u>.89</u>	<u>·63</u>
38.0	-92 .61	.94	.67	<u>.98</u>	.56	.95	-65
39.0	.96 .63	.98	<u>.67</u>	1.00	.64	•97	.67
Negative Ma	argin of Safety? _	Yes	/ No	Station	n:	_ Degree:	
Notes / Comme	nts						
Preliminary PFA	.R(s)?Yes	No	Prelimina	ary PFAR N	umber(s):		
Clarification For	rm(s)? Yes	No	Number	of Forms A	ttached:		
REVISION				DOC NO.	TWR-64240	VOL VOL	



Nozzle Phenolic Sections - Nose Cap

Motor No.: RS	SRM-32	Side: Right (B)	کے :Date	3/26/93
Assessment Eng	gineer(s)/Inspector(s	: CLARK PASSMAN.		· · · · · · · · · · · · · · · · · · ·
Phenolic Section a. Cross-pl b. Ply lifting	ns: y cracking in virgin i	material?	Yes	No Comment #
Station	0°	90°	180°	270°
Location	Erosion Char	Erosion Char	Erosion Char	Erosion Char
1.5	78*	.32 .51	84*	72 <del>*</del>
4.0	.37 .47	<u>.33</u> .51	.47 .42	<u>.29 .53 · </u>
6.0	.37 .44	.33 .5/	.38 .46	.33 .52
8.0	.41 .46	.39 .49	.41 .41	.4/ .55
10.0	.49 .41	.45 .45	48 .37	.47 .48
12.0	.51 .45	.48 .44	<u>.57                                    </u>	.54 .45
14.0	.59 .48	.60 .44	.61 .43	<u>.64</u> <u>.46</u>
16.0	<u>.7/</u> .37	.66 .46	<u>.73 .4/</u>	.66 .44
18.0	.80 .49	.79 .45	.94 .42	<u>.75</u> <u>.49</u>
20.0	1.02 .64	.97 .55	<u> 1.15 .55</u>	<u>.95 .58</u>
22.0	1.61 .78	1.64 .69	<u> 1.73 .73</u>	1.52 .81
24.0	1.89 .85	1.80 .76	<u> 1.90 .84 </u>	<u> 1.80</u> <u>.85</u>
26.0	1.45 .73	1.34 .75	1.41 .74	1.39 .84
Negative M	argin of Safety? _	Yes/ N	o Station:	Degree:
Notes / Comme	nts * DENOTES	MAX AFFECTED	DEPTH	
		/		
Preliminary PFA	AR(s)? Yes	No Prelimi	nary PFAR Number(s):	
Clarification Fo	rm(s)? Yes	No Numbe	r of Forms Attached:	
REVISION .			DOC NO. TWR-64240	VOL

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Phenolic Sections - Cowl

Motor No.: RSI	RM-32		Side: Right	(B)		Date: 2	8-24-67	
Assessment Engineer(s)/Inspector(s): L.E. WILLES								
Phenolic Section  a. Cross-ply b. Ply lifting  Cowl Char and E	cracking in				Y	es	No Co	mment #
	o°0 nosion		90		180	١٥	27	n o
Station Location	Erosion	Char	Erosion	Char	Erosion	Char	Erosion	Char
0.3	.29	,73	.28	.80	NA	1,07	.24	_,73
1.0	,30	,64	.27	.75		.73	.23	<u>.7/</u>
2.0	,29	.60	.24	.65	.30	.72	.24	72
3.0	.25	.65	.2/	.67	.24	.7/	.21	.76
4.0	174.	<u>,45</u>	.20	.7/	,2/	.74	.20	
5.0	•) •	. 7.3	.18	.77	.18	<u>.73</u>	.17	.77
6.0	.17	<u>. 63)</u>	.16	.7/	. 15	.72	15	.80
6.8	20	.9/	.16	.84	NA	1,05	.12	. 84
	Negative Margin of Safety? Yes No Station: Degree:							
Notes / Comme	nts							
Special Issu	16 3.3.17	OF Pr	RE COWL	T MOTOR	2 NSZZL	ES. A.	O PX Y X '	
Preliminary PFA		Yes	NoNo		nary PFAR Nu		ORIGII OF POL	VAL PAGE IS OR QUALITY
REVISION		1 es	NO	HUHING		TWR-6424(	O VOL	·



Nozzle Phenolic Sections - Fixed Housing

Motor No.: RSRM-32 Side: Right (B)						Date: 2	8-26-	
Assessment En	Assessment Engineer(s)/Inspector(s): L.E. WILKES							
Phenolic Sections:  a. Cross-ply cracking in virgin material?  b. Ply lifting?						/es 	No	Comment #
Fixed Housing (	Char and Ero	osion Meas	urements:					
Station	0	•	90	0	180	0°	2	70°
Location	Erosion	Char	Erosion	Char	Erosion	Char	Erosion	Char
0.0	.03	1.05	.06	.95	.03	1,05	.02	1.03
1.0	· <u>02</u>	1.09	.00	.90	,02	,94	,01	1,04
2.0	.01	1.05		1,00	,00	,87	,00	1,08
3.0	.03	1.07		.91	.03	.86		1.05
4.0	1/2	1,08*		.88	.00	<u>.88</u>		1.03
5.0	,00	1.07		.84		.87	-	.98
6.0	.00	1.05		.81		.87		1,00
7.0	,00	1.00		,85		.84		<u>.98</u>
8.0	.00	.92		.84	,00	<u>.73</u>	.00	.82
9.0	NA	.70*	.00	.72	NA	<u>.7/*</u>	NA	,78×
10.75	.44	1.09	,15	1,63	NA	1.66*	17	1,52*
Negative M	argin of Saf	ety?	Yes	N	o Station	n:	_ Degree:	
Notes / Comme	ents + TC	THE KIC	in AEEG	EC760 1	DEPTH (ci	74 K 2 1 1 2	う.	
OF -	OR QUALIT							
	TOR QUAL.	្មីន						
	· 14.17	Y						
Bastlasta es BES	ND (=) 0	V	<b>V</b>	Darler !	PEAD **			
Preliminary PFA	AH(S)?	Yes	No	Prelimi	nary PFAR N	umber(s):		
larification Fo	rm(s)?	Yes	No	Numbe	r of Forms A	ttached:	<del></del>	
			•		DOC NO.	TWR-6424	0 VOL	
REVISION					SEC		PAGE A-109	<del></del>



Nozzle Phenolic Sections - Outer Boot Ring and Flexible Boot

Motor No.: RSRM-32			Side: Right (B)			Date: 8-24-93		
Assessment Engineer(s)/Inspector(s): L.E. WILKES								
Phenolic Sections:  a. Cross-ply cracking in virgin material?  b. Ply lifting?					Ye	es N	No -	Comment #
Flexible Boot/Ou c. Separatio d. Heat effe	ons? octs in separ	rations (if	f present)?				<u> </u>	/
Outer Boot Ring				) <b>°</b> .	180	n o		270°
Station Location	0 Erosion	Char	90 Erosion	Char	180 Erosion	Char	Erosio	
8.0		1.02			,08	.91	NA	- I-
9.0			,02			.87		
10.0		1.03			.01	.87	,06	.56
11.3	,00	1.01	,06	.88	.00	92	,04	<u>.9z</u>
_	Negative Margin of Safety? Yes No Station: Degree: Number of Plies Remaining on the Flexible Boot:							
			Degree		Plies			
			Location 0		maining ろ。/			
			90	·	3. 2			
			180	3	.4			
			270		<u>. / </u>			
	-		ety?	· · · · · · · · · · · · · · · · · · ·				
Notes / Comments * TOTE HERT AFFECTED DEPTH (CRAR LINE)  O SEPARATURE AT O & 270°, NO HERT AFFECTS.								
Preliminary PFAI			No		ary PFAR Nu			
arification For	m(s)?	Yes	No	Number	of Forms At	tached:		•
REVISION _					DOC NO. ]	TWR-64240	VOL GE A-110	

# POSTFLIGHT OBSERVATION RECORD (PFOR) Barrier-Booster Leak Check Port Plug and Port (At Removal) - 126 Degrees

Motor No.: RSRM-32	Side: Right (B)	Date	: 7/9/9	3		
Assessment Engineer(s)/Inspector(	(s): Edin Nolan		, ,			
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?	etal?	Yes	No \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Comment #		
Notes / Comments	\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \		1			
Notes / Comments  D Hainlike fiber found on Leak check plung Shoulder seal. Itain was removed.  It was photographed before it was removed. No evidence to indicate that hair was in place before fining. (Hain-like fiber was a result of disassemely).  Hain-like fiber  Plug  Plug						
Preliminary PFAR(s)? Ye		nary PFAR Number				
Clarification Form(s)?Ye	sNo Numbe	r of Forms Attache	ed:	_		
REVISION		DOC NO. TWR-6-	4240 VOL	<del></del>		



# POSTFLIGHT OBSERVATION RECORD (PFOR) Barrier-Booster Leak Check Port Plug and O-ring (Detailed) - 126 Degrees

Motor No.: RSRM-32 Side:	Right (B)		Date:	119193	
Assessment Engineer(s)/Inspector(s):	den N	Jolan		1 1	
Leak Check Port Plug:  a. Foreign material between the O-rin b. Heat affected or eroded metal? c. Seal surface/thread damage?	/		Yes	No /	Comment #
Secondary O-ring:  d. Heat affected or eroded O-ring?  e. O-ring defects/damage?		·			
Notes / Comments					
		·			
					ż
	,				
Preliminary PFAR(s)? Yes	√_ No	Preliminary PFAR N	Number(s):		
Clarification Form(s)? Yes	No No	Number of Forms	Attached:		
REVISION		DOC NO.	TWR-64240	VOL AGE A-112	<u> </u>

# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 2

Motor No.: RSRM-32	Side: Right (B)	Date: 7 - 9 - 9 3
Assessment Engineer(s)/Inspector(	(s): M. Offol	ter, W. Sterry
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Toro	ring (installed)? etal?	Yes No Comment #
Notes / Comments		
Preliminary PFAR(s)?Yes	s <u>/</u> No	Preliminary PFAR Number(s):
Clarification Form(s)? Yes	s <u>//</u> No	Number of Forms Attached:
REVISION		DOC NO. TWR-64240 VOL



Nozzie Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 2

Motor No.: RSRM-32	Side: Right (B)	Date: 7-9-93	
Assessment Engineer(s)/Inspector	(s): W. Spern, M.	Offolter B. Ferguson	
Leak Check Port Plug:  a. Foreign material between to be Heat affected or eroded me c. Seal surface/thread damage	he O-ring and plug?	Yes No Comm	nent #
Secondary O-ring: d. Heat affected or eroded O-	ring?	/	
e. O-ring defects/damage?	img.		
Notes / Comments			
		•	
		·	
	,		
Preliminary PFAR(s)? Yes	sNo Pre	eliminary PFAR Number(s):	
Clarification Form(s)?Ye	s <u>1</u> No Nu	umber of Forms Attached:	
		,	
REVISION		DOC NO. TWR-64240 VOL	



Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 3

Motor No.: RSRM-32	Side: Right (B)	Date: 7~	9-93
Assessment Engineer(s)/Inspector(s	): N. SPeny, M.	of foller	
Leak Check Port Plug and Port:  a. Soot to or past O-ring?  b. Sooted surfaces?  c. Heat affected or eroded O-ri d. O-ring damage (installed)?  e. Heat affected or eroded ment f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion? i. Metal damage?	ing (installed)?	Yes	No Comment #
Plug Break-away and Running Torqu	ues (inch-lbs):	Break-away: 17 Running: 5	
Notes / Comments			
Preliminary PFAR(s)? Yes	No Preli	minary PFAR Number(s):	
Clarification Form(s)? Yes	√_ No Num	ber of Forms Attached: _	
REVISION		DOC NO. TWR-64240	VOL A-115



Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 3

Motor No.: RSRM-32	Side: Right (B)	Date	: <b>9</b> -9-93
Assessment Engineer(s)/Inspector	(s): W. Spenn	M. Osfolder	B. forguson
Leak Check Port Plug:  a. Foreign material between to b. Heat affected or eroded months. c. Seal surface/thread damage	he O-ring and plug?	Yes	No Comment #
Secondary O-ring: d. Heat affected or eroded O-	ring?		<u> </u>
e. O-ring defects/damage?			
Notes / Comments			
		•	
			:
	/		
Preliminary PFAR(s)?Yes	No 1	Preliminary PFAR Number	(s):
Clarification Form(s)? Yes	s No I	Number of Forms Attache	ed:
		POCNO TRIVIL	1240
REVISION		DOC NO. TWR-6	PAGE A-116



Nozzie Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 4

Motor No.: RSRM-32	Side: Right (B)	Date: ) The 1993
Assessment Engineer(s)/Inspector	(s): A Carlisle	, B. Quick, M. Lyons, J. Richards
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Torg	ring (installed)? etal?	Yes No Comment #
Notes / Comments		
Preliminary PFAR(s)?Yes	No.	Preliminary PFAR Number(s):
Clarification Form(s)? Yes	No	Number of Forms Attached:
REVISION		DOC NO. TWR-64240 VOL



# POSTFLIGHT OBSERVATION RECORD (PFOR) Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 4

Motor No.: RSRM-32	Side: Right (B)		Date: ) Jul	1 1993
Assessment Engineer(s)/Inspector(	(s): A. Carlisk	B. Dukk M. L	yens J. Richa	irds
Leak Check Port Plug:  a. Foreign material between the b. Heat affected or eroded me c. Seal surface/thread damage	ne O-ring and plug	, ,	Yes No	Comment #
Secondary O-ring:				
d. Heat affected or eroded O-	ring?		<u> </u>	
e. O-ring defects/damage?				
Notes / Comments				
			-	
Preliminary PFAR(s)?Yes	s No	Preliminary PFAR N	lumber(s):	
Clarification Form(s)? Yes	No No	Number of Forms A	Attached:	
			1	
REVISION		DOC NO. T		118



Nozzle Internal Joint Leak Check Port Plug and Port (At Removal) - Joint 5

Motor No.: RSRM-32	Side: Right (B)	Date: 8 1/4 /993	
Assessment Engineer(s)/Inspector(	(s): A. Carliste, M.	1. Lyons, J. Richards	
Leak Check Port Plug and Port:  a. Soot to or past O-ring? b. Sooted surfaces? c. Heat affected or eroded O-d. O-ring damage (installed)? e. Heat affected or eroded me f. Foreign material? g. Excessive grease? h. Medium or heavy corrosion i. Metal damage?  Plug Break-away and Running Toro	etal?	Yes No Comme	ent #
Notes / Comments			
Preliminary PFAR(s)? Yes	No P	Preliminary PFAR Number(s):	
Clarification Form(s)? Yes	No N	Number of Forms Attached:	
REVISION		DOC NO. TWR-64240 VOL	



Nozzle Internal Joint Leak Check Port Plug and O-ring (Detailed) - Joint 5

Motor No.: RSRM-32	Side: Right (B)		Date:	85/1/9/19	93
Assessment Engineer(s)/Inspector(	(s): A. Carliste	M. Lyons, J. Ric	hards	,	
Leak Check Port Plug:  a. Foreign material between the b. Heat affected or eroded me c. Seal surface/thread damage	ne O-ring and plug etal?	,	Yes	No V	Comment #
<ul><li>d. Heat affected or eroded O-real</li><li>e. O-ring defects/damage?</li></ul>	ri <b>ng</b> ?			V	
Notes / Comments					
•					
,					
Preliminary PFAR(s)? Yes	No	Preliminary PFAR N	umber(s):	:	
Clarification Form(s)? Yes	No	Number of Forms A	ttached:		· · · · · · · · · · · · · · · · · · ·
REVISION		DOC NO. T	WR-64240	O VOL	

#### POSTFLIGHT OBSERVATION RECORD (PFOR)

Case Factory Joint - Forward Dome

Motor No.: RSRM-32	Side: Right (B)	Date:	29 1993
Assessment Engineer(s)/Inspector	(s): Birch		
Joint Seals and Metal:  a. Heat affected or eroded O- b. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	joint?	Yes	No Comment #
Note: Remove corrosion to determ hardware. Solvent and/or g removal is to be done in a	reen Scotch-Brite <sup>®</sup> pads n circumferential direction or	nay be used to remove aly.	e the corrosion. Corrosion
Notes / Comments FWD / - At Approxim Green Scotchbrite	Dome Tang - nately 119, G Likevoling Sor	Joint prrosion Was ne Pitting,	s Removed With
At Approximate Scotchbrite, Revent At Approximate with Green Scot	ely 297°, Chember ing a harge Pi+ = ety 186°, Chembook/ chbrite Revealing	k Was Remove In the tang Corrosion Combina Some Pitting =	d with Green Sealing Zone tion was Removed In The Tang Seal Zone
Preliminary PFAR(s)? Yes	s No Prelim	inary PFAR Number(s)	6219/63 576-03
Clarification Form(s)? Yes	s No Numbe	er of Forms Attached:	
REVISION		DOC NO. TWR-6424	PAGE A-121

# POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint – Forward Cylinder/Cylinder

Motor No.: RSRM-32	Side: Right (B)	Date: 29 Sept 93
Assessment Engineer(s)/Inspector(	(s): Birch	
hardware. Solvent and/or g	i joint? I leak check port? In leak check port? In leak check port? In leak check port? I leak check port?	Yes No Comment #
Notes / Comments		
Preliminary PFAR(s)?Ye	s No Preliminary PFAF	Number(s):
Clarification Form(s)?Yes		
REVISION	DOC NO.	TWR-64240 VOL



# POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint - Forward Center

Motor No.: RSRM-32	Side: Right (B)	Date:	10-52-93	
Assessment Engineer(s)/Inspector	(s): H. ZAREMBA			
Joint Seals and Metal:  a. Heat affected or eroded O- b. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	n joint?	Yes	No V	Comment #
Note: Remove corrosion to determ hardware. Solvent and/or gremoval is to be done in a	reen Scotch-Brite® pads m	ay be used to remov		
Notes / Comments				
Preliminary PFAR(s)?Yes	s <u> </u>	inary PFAR Number(s	):	
Clarification Form(s)? Yes	s No Numbe	er of Forms Attached:		_
REVISION		DOC NO. TWR-642	40 VOL	

#### POSTFLIGHT OBSERVATION RECORD (PFOR)

Case Factory Joint - Aft Center

Motor No.: RSRM-32	Side: Right (B)	Date: 10-15-92
Assessment Engineer(s)/Inspector	(s): ERIC HAY	
Joint Seals and Metal:  a. Heat affected or eroded O- b. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	ring? n joint?	Yes No Comment #
hardware. Solvent and/or g	reen Scotch-Brite <sup>®</sup> pads may be used circumferential direction only.	
Notes / Comments  31696	ERRER NONE	
•		
Preliminary PFAR(s)? Yes	s No Preliminary PFAR N	Number(s): N/A
Clarification Form(s)? Yes	No Number of Forms	Attached:
REVISION	DOC NO.	TWR-64240 VOL PAGE A-124



# POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint - ET Attach/Stiffener

Motor No.: RSRM-32	Side: Right (B)	Date:	8-2	3-9-3
Assessment Engineer(s)/Inspector(	(s): G. Ruh			
Joint Seals and Metal:  a. Heat affected or eroded Ob. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in Note: Remove corrosion to determinate the corrosion of the corresponding to the corrosion of the corresponding of the correspond	i joint? i leak check port? nine if pitting has occurr	Yes	No No en not to de the corro	Comment #
removal is to be done in a				310111
Notes / Comments				
·				
Preliminary PFAR(s)? Yes		liminary PFAR Number(s		
Clarification Form(s)?Ye	s No Nur	nber of Forms Attached	·	_
REVISION		DOC NO. TWR-642	40 VOL	

### POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint - Stiffener/Stiffener

Side: Motor No.: RSRM-32 Right (B) Date: 08 20 93 Assessment Engineer(s)/Inspector(s): ARRYL MARBLE Joint Seals and Metal: Yes No Comment # a. Heat affected or eroded O-ring? b. Heavy corrosion (pitting) in joint? c. Heavy corrosion (pitting) in leak check port? Note: Remove corrosion to determine if pitting has occurred. Care should be taken not to damage the hardware. Solvent and/or green Scotch-Brite® pads may be used to remove the corrosion. Corrosion removal is to be done in a circumferential direction only. Notes / Comments SIJFF TO SIJFF JOINT Preliminary PFAR(s)? Preliminary PFAR Number(s): \_ Number of Forms Attached: Clarification Form(s)? \_\_\_\_ Yes REVISION \_\_\_

# POSTFLIGHT OBSERVATION RECORD (PFOR) Case Factory Joint - Aft Dome

Motor No.: RSRM-32	Side: Right (B)	Date: 08-20-93
Assessment Engineer(s)/Inspector	(6): DREETL MARBLE	
a. Heat affected or eroded Ob. Heavy corrosion (pitting) in c. Heavy corrosion (pitting) in	ring?	No Comment &
hardware. Solvent and/or g	mine if pitting has occurred. Care should green Scotch-Brite <sup>®</sup> pads may be used to circumferential direction only.	d be taken not to damage the premove the corrosion. Corrosion
Notes / Comments	E	•
		·
Preliminary PFAR(s)?Ye	es No Preliminary PFAR N	lumber(s):
Clarification Form(s)?Ye	No Number of Forms	Attached:
REVISION	DOC NO.	PAGE A-127



### Appendix B Nozzle Postfire Data

# Final Postflight Hardware Evaluation Report RSRM-32 (STS-57)

November 1993

#### Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No.

NAS8-38100

DR No.

4-23

WBS No.

4C601-04-01

ECS No.

SS4775



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0.15 0.67 0.93 1.408 0.15 0.75 0.60 1.01 1.408

Angular Location						1				
0 degrees	1.0	9.4	4.6	0.0	12.0	16.0	20.0	24.0	28.0	32.0
	7	35	11	0.36	0.35	Ą.	NA	ď	0.30	0.21
Measured Eroston			0.71	0.71	91.0	NA	ď	ΥN	0.70	0.75
			0.57	0.57	0.61	NA	NA	NA	95.0	09.0
Adjusted Char		7	1.12	1.32	1.36	K N	W.	NA	1.21	1.11
Denomination of the page of	200	1.731	1.411	1.629	1.524	MA	K E	٧N	1.328	1.372
9	0.31	0.29	0.26	0.23	0.12	۲ 2	N N	ИА	0.10	0.24
90 degrees										
6		3.5	0.37	0.37	0.32	Ý.	V N	K N	NA	0.19
	91.	9.0	0.72	0.68	0.73	NA	NA	K N	N A	0.78
		9 6	0.58	0.54	0.58	4 Z	MA	ď Z	N.	0.62
Adjusted Chai		1.36	1.13	1.31	1.27	NA	N.A	NA	MA	1.10
	1.807	1.731	1.411	1.629	1.524	N.	NA	۷ ۷	1.328	1.372
		3 6	0.25	0.24	0.20	٧×	ΚN	NA	NA	0.24
Margin of Sarety		• •								
180 degrees										
		3.4	0.36	0.35	0.33	A N	Y N	K Z	0.28	0.25
Team of the state		0.74	0.75	0.70	0.10	NA	٧×	N N	0.70	0.68
	2 4	6.0	09.0	0.56	95.0	NA	ΥN	K N	95.0	0.54
		1 32	1.14	1.29	1.26	H.A	Y N	K Z	1.18	1.10
Denomination of the contract o	1 807	1.731	1.411	1.629	1.524	NA	NA	ΑN	1.328	1.372
Margin of Safety	0.35	0.31	0.24	0.26	0.21	N.A.	ď.	٧ ٢	0.13	0.24
270 degrees										
20 C A A C A C A C A C A C A C A C A C A	0.36	0.37	0.36	0.35	0.33	K N	N	NA	0.28	0.19
Team Charles	0.76	0.74	0.77	0.74	0.65	ΥN	<b>4</b> E	NA	77.0	0.82
* *************************************	190	0.59	0.62	0.59	0.52	ΥN	Z Z	MA	0.62	99.0
	1.37	1.37	1.16	1.33	1 21	MA	٧×	MA	1.25	1
brown Lines Thickness	1.807	1.731	1.411	1.629	1.524	НА	Y N	K N	1.328	1.372
Hargin of Safety	0.32	0.26	0.22	0.22	0.26	NA	Y E	Y N	0.01	0 . 20
Minimum margin of safety is Maximum margin of safety is	ety is	0.07 at	0.07 at station 28.00 degree 270.00 0.52 at station 34.00 degree 0.00	28.00 de 34.00 de	gree 270 gree 0.	00.				

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### Thickol CORPORATION

RSRM-32A Throat Assembly Erosion and Char Data

Angular Location						Stations	ons						
0 degrees	1.0	2.0	4.0	0.9	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
Heasured Erosion	1.07	1.11	1.17	1.23	1.29	1.18	1.15	1.13	1.08	0.96	0.76	0.53	0.44
Adjusted Char	0.47	0.53	0.51	0.47	96.0	0.42	0.45	0.47	0.52	0.62	0.64	0.64	99.0
Denomenator	2.72	2.89	2.98	3.05	3.05	2.88	2.86	2.84	2.81	2.70	2.32	1.86	1.70
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.17	0.13	0.11	0.08	+0.04	0.18	0.23	0.28	0.32	0.33	0.39	0.39	0.24
90 degrees						÷							
Menning Design	1.06	1.08	1.14	1.20	1.21	1.19	1.16	1.16	1.05	96.0	0.78	0.51	0.47
Team Constant	0.62	0.61	0.68	0.64	0.56	0.54	0.57	0.58	0.68	9.76	0.71	0.81	0.80
Adjusted Char	0.47	0.46	0.51	0.48	0.42	0.41	0.43	0.43	0.51	0.61	0.57	0.65	0.64
Denomenator	2.70	2.73	2.92	3.00	2.94	2.89	2.85	2.86	2.74	7.66	2.27	1.83	1.74
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.18	0.19	0.14	60.0	0.08	0.18	0.23	0.27	0.36	0.35	0.42	0.41	0.21
180 degrees													
Measured Erosion	1.06	1.09	1.16	1.20	1.25	1.18	1.14	1.15	1.10	96.0	0.11	0.51	0.41
Measured Char	0.68	99.0	0.59	0.64	0.50	0.55	0.62	0.59	0.65	99.0	0.75	0.81	0 . 80
Adjusted Char *	0.51	0.50	0.44	0.48	0.38	0.41	0.47	0.44	0.49	0.54	09.0	0.65	0.64
Denomenator	2.76	2.80	2.87	3.00	2.97	2.88	2.86	2.85	2.81	5.60	2.29	1.83	1.68
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0.15	0.16	0.15	60.0	0.07	0.18	0.23	0.27	0.32	0.38	0.41	0.41	0.26
270 degrees													
Measured Erosion	1.03	1.07	1.12	1.19	1.23	1.15	1.13	1.13	1.14	96.0	27.0	0.47	0.41
Measured Char	0.62	0.65	0.68	0.70	0.55	0.55	09.0	95.0	0.58	99.0	0.17	0 . B 4	0.82
Adjusted Char .	0.47	0.49	0.51	0.53	0.41	0.41	0.45	0.42	0.43	0.53	0.62	0.67	99.0
Denomenator	2.64	2.75	2.88	3.04	2.98	2.82	2.82	2.78	2.82	2.54	2.21	1.78	1.64
RSRM Liner Thickness	3.174	3.247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
Margin of Safety	0 . 20	0.18	0.15	0.08	0.07	0.21	0.25	0.30	0.31	0.41	9 7 0	0.45	0.29
Minimum margin of saf	fety is fety is	0.04 at	station station 2	8.00 degree 0.00 20.00 degree 270.00	ree 0.0 ree 270.	00							
	suredc	easured char adjusted to end	sted to e	and of ac	of action time	•							
3	,	1	minim	minimum liner thickness	thicknes	<b>5</b> 1	•						

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#### Thickol CORPORATION

SPACE OPERATIONS

RSRM-32B Throat Assembly Erosion and Char Data

Angular Location						Stations	suo						
degraes	1.0	2.0	4.0	6.0	o .	10.0	12.0	14.0	16.0	18.0	20.0	22.0	23.0
		:	-	,	-	1.18	1.13	1.12	1.04	0.93	0.73	0.52	0.41
u o 1	1 10	1.10	01.0			5.0	0.55	0.56	0.63	0.64	9.76	0.75	0.78
	. 6				. 4		0.41	0.42	0.47	0.51	0.61	09.0	0.62
		0 . 50	. 4.0				2 78	2.17	2.67	2.50	2.22	1.79	1.60
	2.80	2.82	2.85	56.7	3 1 8 3	1 107		3 626	3.710	3.586	3.231	2.583	2.110
0 8 8	3.174	3.247	3.314	7.780		67.0	0.27	0.31	0.39	0.43	94.0	0.44	0.32
Margin of Safety	0.13	. 1.0	01.0	7 1 . 0	<u>.</u>								
90 degrees													
	;	:	:	. ,,	1 25	1.23	1.19	1.17	1.10	9.95	0.74	0.50	0.40
Measured Erosion	1.11	1.15	1.10	7.1	1 4 4			0.63	0.58	0.71	0.80	0.83	0.85
Measured Char	7 9 0	99.0	0.67	9.0	70.0			0.47	0.43	0.57	0.64	99.0	0.68
Adjusted Char *	0.47	0 . 50	0.50	0.0		, ,	66.6	2 93	2.74	2.61	2.28	1.83	1.65
	2.80	2.92	2.99	00.0	70.6	1 107	3.517	3.626	3.710	3.586	3.231	2.583	2.110
RSRM Liner Thickness	3.174	3.24/		20.00		11.0	0.20	0.24	0.35	0.37	0.42	0.41	0.28
Margin of Safety	0 . 1 3	0 . 1 1	11.0	· ·		:							
180 degrees													
!			1 14	1.20	1.23	1.16	1.15	1.12	1.15	0.93	0.75	0.49	0.41
Measured Erosion					69	0.58	0.58	0.59	0.63	0.71	0.78	0.81	0.19
Measured Char		2 (	6.0		. 4	6 4 3	0.43	0.44	0.47	0.57	0.62	0.65	0.63
Adjusted Char	9 . 0	0.0				2.86	2.84	2.79	2.89	2.57	2.28	1.79	1.61
	7.70	00.7	7.07			3 397	3.517	3.626	3.710	3.586	3.231	2.583	2.110
RSRN Liner Thickness	3 . 1 /4	3.64/		207.6			7 0	0.0	0.28	0.40	0.42	4 7 0	0.31
Margin of Safety	0 . 1 8	0.16	0 . 1 /	0 . 10									
270 degrees												;	:
#	1 0 1	1.11	1.16	1.21	1.21	1.22	1 . 18	1.17	1.09	0.93	0.73	0.00	
TOTACIN TOTACE	9	9.0	0.68	0.67	0.57	95.0	0.58	0.59	9.65	67.0			
		7	0.51	0.50	0.43	0.42	0.43	•	6 . 0	0 0	0 1		
Adjusted Char		2 8 3	2.96	3.05	2.95	96.2	2.90	2.89	2.79	2.61	2.27	1.87	
	174	1 247	3.314	3.280	3.183	3.397	3.517	3.626	3.710	3.586	3.231	2.583	7.11.0
n	0.14	0.15	0.12	80.0	80.0	0.15	0.21	0.25	0.33	0.37	7 . 0	86.0	77.0
Tes 10 distant materials	ety is		station	8.00 de	8.00 degree 90.00	0.0							
	safety is	0.46 at station	station	station 20.00 degree 0.00	.0	0							
* ·	beined	har adju	sted to	Measured char adjusted to end of action time	ction ti	0							
			minim	minimum liner thickness	thickne	#S							
Margi	In of St	argin of Safety = -											

DOC NO. TWR-64260

### Thickol CORPORATION

SPACE OPERATIONS

RSRM-32A Nose Inlet Assembly Erosion and Char Data

inquiar Location						Stations	suc						
degrees	5.1	0.4	0 . 9	0 · <b>8</b>	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0
	,	•		9	95	0.58	0.70	0.78	0.94	1.15	1.79	1.94	1.40
leasured Erosion	67.0	9.4	•		. 4	0.51	4	0.46	0.44	0.51	0.63	0.70	0.10
teasured Char	0		? .			14	3.5	0.37	0.35	0.41	0.50	95.0	0.53
djusted Char	0 4 0	20.0	7					, ,	2 32	2.83	4.21	4.58	3.46
Jenomenator	1.08	1.28	1.35	1.49				300		10.1	4.713	4.691	3.863
SARM Liner Thickness	1.776	2.038	2.248	2.458	2.668	9/9.7	00.5	3 . 2 3 0					
fargin of Safety	0.64	0.59	0.67	0.65	0.68	0.72	99.0	0.63	0.51	<b>*</b>	0.12	30.0	71.
30 degrees													
•	į	•	;	7 7	0	0.48	0.65	0.69	0.81	1.05	1.69	1.79	1.27
Teasured Erosion	4		7.0			0 7		0.43	0.38	0.39	0.55	0.71	9.76
Heasured Char	Y N	0.43	0 . 48	9.	9 .	. ·	7.				77	0.57	0.57
Adjusted Char	Y Z	0.34	0.38	0.39	0 . 38	6.39	1 . 0						3,
Denomination	<b>4 2</b>	1.23	1.32	1.37	1.48	1.45	1.81	1.81	2.00	4 . 4 .			
PART TACKDER	1.776	2.038	2.248	2.458	2.668	2.878	3.088	3.298	3.507	600.	. /13	160.5	
Margin of Safety	N.	99.0	0.70	0.79	0.80	86.0	0.71	0.82	0.75	0.63	0 7 . 0	6 0 0	61.0
180 degrees													
6 6 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	4	0 32	E . O	0.44	0.45	0.45	0.58	0.61	91.0	0.93	1.57	1.76	1.30
			~	0.39	0.45	0.49	0.42	0.46	0.41	0.47	0.63	0.78	7.7
Measured Char	¢ ,	1			9.6	0.39	0.34	0.37	0.33	0.38	0.50	0.62	0.58
Adjusted Char	ď:	1.	7.			3.0		1.68	1.93	2.33	3.77	4.30	3.32
Denomenator	4 Z	1.15	1.19	77.1				3 2 9 8	3.507	4.055	4.713	4.691	3.863
RSRM Liner Thickness	1.776	2.038	2.248	2 . 4 5 8	2 . 6 6 9	0 7 0 7				14	2.0	60 0	0.16
Margin of Safety	K K	77.0	68.0	0.94	86.0 8	1.07		98.0	0	<b>:</b> : -	•		
270 degraes													
	2	0.13	0.37	0.43	0.49	64.0	0.59	0.62	17.0	0.95	1.49	1.85	1.45
		4	. 4 7	0	0.50	0.50	0.48	0.45	0.47	0.47	80 80	6.0	67.0
	C 4				0.40	0.40	0.38	9.36	0.38	0.38	0.70	0.71	0.59
Adjusted Char	۲ : د					1.48	1.66	1.69	1.89	2.37	3.86	4.59	3.64
Denomenator	VZ.	1.22	17.7	1.1.	26.1	2.878	3.088	3.298	3.507	4.055	4.713	4.691	3.863
RSRM Liner Thickness Margin of Safety	I.//B	0.67	98.0	0.82	0 8 . 0	0.94	98.0	96.0	98.0	0.71	0.22	0.02	90.0
Minimum margin of sai	ety is	0.02 at 1.07 at	station	24.00 de	afety is 0.02 at station 24.00 degree 270.00 afety is 1.07 at station 12.00 degree 180.00	000							
*	o peansi	ther adju	sted to	end of a	leasured char adjusted to end of action time	•							
			minim	um liner	minimum liner thickness	*	•						

SEC

Data	
Char	•
and	<u>مح</u>
y Erosion	Inle
Assembly	A box on
Inlet A	4
No S &	3
RSRM-32A	

Angular Location							
0 degrees	28.0	30.0	32.0	34.0	36.0	38.0	39.0
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	, ,	6	6.0	88.0	06.0	96.0	66.0
Measured Erosion	• • •			190	0 9 0	0.53	95.0
	9 9				3 7 0	0.7	0.42
Adjusted Char *	0.50	6.4.0	· ·				
1012000000	3.06	2.42	2.46	2.33	7 . 36	71.7	7
Secondary recent Management	3.508	3.252	2.950	3.182	3.200	3.026	3.000
Margin of Safety	0.15	0.34	0.20	0.36	0.35	0.25	0 . 20
90 degrees							
	91	0.87	06.0	0.83	98.0	0.94	0.94
		64.0	0.59	0.60	0.59	0.64	0.56
Measured Char			7	0.45	0.44	0.48	0.42
Adjusted Char		, ,	2 2 2	2.22	2.27	2.48	2.40
- 1		1 252	2.950	3.182	3.200	3.026	3.000
RSRM Liner Interness					7	0.22	0.25
Margin of Safaty	0 . 28	5.0	67.0			· ·	
180 degrees							
TOTAL DESIGNATION	NA	0.82	0.92	06.0	0.92	96.0	1.00
	4	99.0	0.55	0.53	0.55	95.0	0.61
	4	0 20	0.41	0.40	0.41	0.42	9 . 4 6
	1	3 2 6	2.36	2.30	2.36	2.48	2.57
Denomenator		3 252	2.450	3.182	3.200	3.026	3.000
Margin of Safety	N V	0.4	0.25	0.39	96.0	0.22	0.17
270 degrees							
	1.15	0.93	1.01	0.87	0.91	86.0	1.01
	6.0	0.64	99.0	0.63	0.67	0.72	0.70
			0.0	0.47	0.50	0.54	0.53
Adjusted Char				2 33	2.45	2.64	2.68
	2.93			3 182	3.200	3.026	3.000
RSRM Lines Thickness	900.5			2.0	-	0.15	0.12
Margin of Safety	0 7 0	0.32	71.0				

Margin of Safety = 2.00 x erosion + 1.25 x adj char\*

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Angular Location										•	;
0 degrees	1.5	<b>9</b> . <b>9</b>	6.0	0.0	10.0	12.0	14.0	16.0	18.0	20.0	0.22
	:			0.41	0.49	0.51	0.59	17.0	0.80	1.02	1 . 61
Measured Eroston	< :				141	0.45	0.48	0.37	0.49	0.64	0.78
Measured Char	ď.		F	, ,		9.0	0.38	0.30	0.39	0.51	0.62
Adjusted Char *	K Z	9 .	6.0				1 66	1.79	2.09	2.68	4.00
Denomenator	۲ ۲	1 . 2 1	1.16	1.28	1.19			1 20 R	3.507	4.055	4.713
Special Thickness	1.776	2.038	2.248	2.458	2 . 6 6 5	0 / 0 . 7					
Margin of Safety	¥ Z	0.68	0.91	0.92	0.92	96.0	98.0	4	89.0	16.0	
90 degrees											
	,	;	,	9	4.5	0.48	09.0	99.0	0.79	0.97	1.64
Measured Erosion	0 . 3 2	5				77	44	0.46	0.45	0.55	69.0
Measured Char	0.51	0.51	16.0	6.0	6.0			0.37	0.36	0.44	0.55
Adjusted Char	0.41	0.41	0.41	0.39	9 .					7	1.97
Depose	1.15	1.17	1.17	1.27	1.35	1.40	1.04	1.70			4 713
A CONTRACTOR OF STREET	1.776	2.038	2.248	2.458	2.668	2.878	3.068	3 . 2 3 6	7 00 . 0		
,	0.54	0.74	0.92	0.94	96.0	1.06	80 0	0.85	67.0	. a .	61.0
180 degrees											
	2		3.8	0.41	0.48	0.57	0.61	0.73	0.94	1.15	1.73
Measured Eroston	۲ :			17	7.	0.39	0.43	0.41	0.42	0.55	0.73
Measured Char	< Z					-	0.34	0.33	0.34	7.0	0.58
Adjusted Char	ď Z	0.34					7 7	1 87	2.30	2.85	4.19
Denomenator	Y N	1.36	1.22	1.23	1.33			900	1 507	4.055	4.713
Section Throng	1.776	2.038	2.248	2.458	2.668	2 . 8 / 8	3 . 0 9	9.7			
Margin of Safety	V R	0.50	0.84	1.00	1.01	88.0	. 0	9	76.0		
270 degrees											
	2	0.29	0.33	0.41	0.47	0.54	0.64	99.0	0.75	0.95	1.52
Measured Eroston	4		0.52	0.55	0.48	0.45	0.46	0.44	0.49	0 .	19.0
Measured Char			0 42	0.44	0.38	0.36	0.37	0.35	0.39	9 . 4	0
Adjusted Char	¢ :		8	1.37	1.42	1.53	1.74	1.76	1.99	2.48	
Denomenator			2 248	2.458	2.668	2.878	3.088	3.298	3.507	4.055	4.713
MSRM Liner intexpess Margin of Safety	N. Y.	0.84	0.91	0.79	88.0	88.0	6.77	0.87	0.76	49.0	77.0
	4	0.01 at	station	24.00 de	gree 180	00.					
Maximum margin of safety is 1.06 at station 12.00 degree 90.00	fety is	1.06 at	station	12.00 de	gree 90.	00					
* *	asured	Measured char adjusted to end of action time	sted to	e jo pue	ction ti	:					

minimum liner thickness Margin of Safety =

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VOL

Angular Location			Stations	suo	-		
seexbep 0	28.0	30.0	32.0	34.0	36.0	38.0	39.0
	. 0 .	6	0.95	8.0	98.0	0.92	96.0
				99.0	0.64	0.61	0.63
Measured Char			. 4	0.50	0.48	0.46	0.47
-				3.0	2.32	2.41	2.51
	78.7	2.5		187	200	3.026	3.000
 • c	3.508	3 . 2 . 2	000			2.0	0.19
Margin of Safety	0.24	0.35	0 7 . 0				
90 degrees							
4	70	•	06.0	0.85	0.87	96.0	86.0
				9.0	0.71	0.67	0.67
Memorated Char			. 4	67.0	0.53	0.50	05.0
Adjusted Char	9 6		2 4 1	2.31	2.41	2.51	2.59
Denomenator		2 2 2 2	050 6	3.182	3.200	3.026	3.000
RSRM Liner Thickness							9.
Margin of Safety	0.30	0.39	0.22		6.93	17.0	1.
180 degrees							
	1.22	0.95	86.0	06.0	0.89	96.0	1.00
	99	9	0.59	09.0	0.63	95.0	0.64
			77	0.45	0.47	0.42	0.48
Adjusted Char				3 16	2 37	2.48	2.60
Denomenator	3.00	6.00			200	3 0 26	3.00
RSRM Liner Thickness	3.508	3 . 2 5 2	006.7	701.	7 .		
Margin of Safety	0.15	0.28	0.17	0.35	6.33	77.0	61.0
270 degrees							
	11.11	06.0	96.0	0.88	0.89	0.95	0.97
	9	9	95.0	0.53	0.63	0.65	0.67
				40	0.47	0.49	0.50
Adjusted Char "	0 . 50	A	7.				
Denomenator	2.84	2.41	2 . 4 4	7 . 26	75.7	70.7	
RSRM Liner Thickness	3.508	3.252	2.950	3.182	3.200	3.026	20.
Margin of Safety	0.24	0.35	0.21	0 . 41	0.35	0.21	0.1

\* Measured char adjusted to end of action time

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Angular Location												
0 degrees	0.3	1.0	2.0	3.0	4.0	5.0	6.0	80 90	0 . 8	0.6	10.0	11.3
A CONTRACTOR OF A CONTRACTOR O	0.30	0.29	0.27	0.26	0.24	0 . 20	0.16	0.25	0.10	0.09	0.05	0.07
	08.0	0.73	69.0	0.65	0.62	0.78	0.70	0.82	0.92	0.91	06.0	0.92
Taken Telephone	4.0		0.55	0.52	0.50	0.62	95.0	99.0	0.74	0.73	0.72	0.74
	1 40		1.23	1.17	1.10	1.18	1.08	1.36	1.25	1.23	1.16	1.21
Denomination of the party of th	4.38	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.03	0.14	0.28	0.41	0.58	0.53	0.75	0.43	0.28	0.36	0.46	0.41
90 degrees												
	0.31	0.32	0.25	0.22	0.19	0.18	0.15	0.15	0.10	0.10	0.08	0.07
Mesan Contraction	0.72	99.0	0.68	69.0	0.68	0.72	0.67	0.87	0.82	0.80	0.79	0.81
Addington Char	0.58	0.53	0.54	0.55	0.54	0.58	0.54	0.70	99.0	0.64	0.63	0.65
Denomenator	1.34	1.30	1.18	1.13	1.06	1.08	1.03	1.27	1.13	1.11	1.07	1.08
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.07	0.15	0.34	0.46	0.63	0.68	0.84	0.53	0.41	0.51	0.58	0.58
180 degrees												
Measured Erosion	0.30	0.27	0.23	0.20	0.18	0.15	0.14	0.18	0.07	0.03	0.01	00.00
Measure Char	0.71	0.68	0.62	99.0	0.63	69.0	91.0	0.82	0.95	9.0	0.92	0 . 90
Addusted Char	0.57	0.54	0.50	0.53	0.50	0.55	0.61	99.0	9.16	0.75	0.74	0.72
Denomentor	1.31	1.22	1.08	1.06	66.0	66.0	1.12	1.25	1.25	1.17	1.12	1.08
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.10	0.23	0.46	95.0	0.75	0.83	99.0	0.55	0.29	£ .	0.51	0.58
270 degrees												
Measured Erosion	0.28	0.26	0.22	0.21	0.18	0.16	0.14	0.23	0.14	0.05	0.04	0.05
Measured Cher	0.78	0.70	0.67	0.71	0.72	0.71	0.70	0.82	0.92	1.01	0.94	0.97
Adjusted Char *	0.62	0.56	0.54	0.57	0.58	0.57	9.20	99.0	0.74	0 . 8 1	0 . 75	9
Denomenator	1.34	1.22	1.11	1.13	1.08	1.03	1.05	1.33	1.31	1.29	1.19	1.24
RSRM Liner Thickness	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
Margin of Safety	0.07	.0 . 23	0 . 42	9 . 0	09.0	97.0	0.80	0.46	0.22	0.30	0.42	0.37
Minimum margin of sat Maximum margin of sat	safety is safety is	0.03 at	station	0.30 degree 6.00 degree	0.30 degree 0.00 6.00 degree 90.00	00						

\* Measured char adjusted to end of action time

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## Thickol CORPORATION

SPACE OPERATIONS

RSRM-32B Cowl, Outer Boot Ring Assembly Erosion and Char Data

degrees	0.3	1.0	2.0	3.0	4 . 0	5.0	0.9	6.8	0.8	0.6	10.0	11.3
	;		9	3.5	0.24	0.19	0.17	0.20	90.0	0.04	0.01	00.0
Erosion	67.0		67.0	1 4		0.73	69.0	0.91	1.02	1.01	1.03	1.01
	. 73						5.5	0.73	0.82	0.81	0.82	0.81
justed Char	95.0	0.51		70.0					-	1.27	1.25	1.21
	1.31	1.24	1.18	1.15	1.16	11.1				7 2 7 4	1 687	1 703
The Charles	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1 . 9 4 3	000 T			
1	0.10	0.21	0.34	0.44	0.49	0.63	0.74	0.40	0.22	0.32	6 . 50	<b>.</b>
degrees												
		1	;	;			91.0	91.0	0.05	0.02	0.03	90.0
Erosion	0.28	0.27	97.0	7.0	0	, ,		8.4	0.93	06.0	0.87	0.88
sured Char	0.8.0	0.75	9.0	0.0	7 / 1					66.0	0 2 0	0.10
Char.	0.64	0 . 60	0.52	0.54	0.57	70.0						-
	1.36	1.29	1.13	1.09	1.11	1.13	1.09	1.25		11.1		1 . 1
	***	1 499	1.577	1.655	1.733	1.811	1.889	1.943	1.600	1.6/4	1.08/	707.1
rgin of Safety	90.0	0.16	0.40	0.52	95.0	09.0	0.73	95.0	0.34	0.51	. 5. 5 5. 5	6.49
degrees.												
٠	;		0.0	2.4	0.21	0.18	0.15	NA	80.0	0.05	0.01	0.00
asured Erosion	4 2	2					0.72	× M	0.91	0.87	0.87	0.92
asured Char	<b>4</b> Z	0.73	7 . 0	7 .				4 2	0.73	0.70	0.10	0.74
susted Char *	NA	0.58	0.58	0.57	60.0	0.0					1 0 6	1.10
pomenator	۲,	1.33	1.32	1.19	1.16	1.09	1.09	44	77.7	7.7		1 203
TO THE TAX OF THE PARTY OF THE	1.438	1.499	1.577	1.655	1.733	1.811	1.889	1.943	000.	1.0.1		
rgin of Safety	Y N	0.13	0.19	0.39	0.49	99.0	0.73	K Z	0.32	0 . 0	6. 59	
0 degrees												
1	7.	, ,	0.24	0.21	0.20	0.17	0.15	0.12	K N	0.04	90.0	0.0
asured Eroston			7.	9. 76	0.75	0.77	0.80	9.0	N A	98.0	98.0	76.0
ssured Char					09.0	0.62	0.64	0.67	ď Z	0.69	0.69	
justed Char "	0.0				5	1.11	1.19	1.19	٧×	1.09	1.12	1.16
nomenator	1 . 71	1.1	1.60	7 7 7	1 733	1.811	1.889	1.943	1.600	1.674	1.687	1.703
RM Liner Thickness rgin of Safety	1.438 0.19	0.28	0.31	0.40	0.51	0.63	0.59	0.64	Z Z	0.53	0.50	0.46
nimum margin of safety is 0.06 at station ximum margin of safety is 0.74 at station	ety is (	0.06 at	station	0.30 dec	0.30 degree 90.00 6.00 degree 0.00	000						
**************************************	sured of	har adju	sted to	end of a	ction ti	•						
-			minim	minimum liner thickness	thickne	en 10	,					
ximum margin of sar	sty 1s ( sured of	o./4 ac har adju	station sted to	safety is 0.74 at seation 0.00 daying the Messured char adjusted to end of action time maintain liner thickness	thickne		•					

Margin of Safety = 1.50 X erosion + 1.50 X adj char \*

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500	
ati	
St	

0 degraes	00.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	9.00	9.00	10.75
Measured Erosion	80.0	0.04	00.0	0.03	0.03	0.01	0.01	0.01	00.0	00.0	0.02
Measured Char	1.20	1.13	1.07	0.97	1.01	1.00	1.04	1.02	0.92	0.93	1.84
Adjusted Char *	96.0	06.0	99.0	0.78	0.81	0.80	0.83	0.82	0.74	0.74	1.47
Denomenator	1.36	1.21	1.07	1.03	1.07	1.02	1.06	1.04	0.92	0.93	1.88
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	1.60	0.72	17.0	77.0	0.71	08.0	0.73	97.0	1.00	1 . 61	0.62
90 degrees											
Measured Erosion	0.05	90.0	0.01	0.01	0.01	0.01	00.0	00.0	00.0	Α.	N.
Measured Char	1.12	1.06	96.0	0.97	0.93	0.91	0.95	0.92	0.78	K N	MA
Adjusted Char *	06.0	0.85	0.77	0.78	0.74	0.73	9.76	0.74	0.62	4 Z	N.
Denomenator	1.22	1.18	96.0	66.0	0.95	0.93	0.95	0.92	0.78	4 Z	Y.
RSRM Liner Thickness	3.607	2.081	1.825	1.627	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.12	91.0	98.0	0.85	0.93	0.97	0.93	0.99	1.35	ž	۲,
180 degrees											
Measured Erosion	0.04	0.03	0.03	00.0	0.01	00.00	00.0	0.01	00.0	00.0	0.15
Measured Char	1.13	1.03	1.10	1.13	1.07	1.04	1.04	0.99	98.0	0.83	1.45
Adjusted Char *	06.0	0.82	0.88	0.90	0.86	0.83	0.83	0.79	69.0	99.0	1.16
Denomenator	1.21	1.07	1.14	1.13	1.09	1.04	1.04	1.01	0.86	0.83	1.75
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.032	1.834	1.836	2.426	3.048
Margin of Safety	2.15	96.0	09.0	0.62	0.68	91.0	97.0	0.82	1.13	1.92	0.74
270 degrees											
Measured Erosion	00.0	0.01	0.04	0.03	0.04	0.03	0.05	00.0	0 . 0	00.0	00.0
Measured Char	1.21	1.08	1.00	1.05	1.02	1.01	1.00	96.0	0.93	0.78	1.73
Adjusted Char *	76.0	98.0	0.80	9.84	0.82	0.81	0.80	0.17	0.74	0.62	1.38
Denomenator	1.21	1.10	1.08	1.11	1.10	1.07	1.10	96.0	0.93	0.78	1.73
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.15	0.89	69.0	0.65	99.0	0.71	19.0	0.91	0.97	2.11	97.0
Minimum margin of saf Maximum margin of saf	safety is 0.60 at safety is 2.15 at	0.60 at 2.15 at	station	2.00 de	degree 180.00 degree 180.00	000					
	sured c	har adju	sted to	Measured char adjusted to end of action time	ction tin	:					
-			minim	minimum liner thickness	thickne	88					
Margi	Margin of Safety	H			36 4	1 4 4	1 ! .				

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	•	
-	•	
	,	

0 degrees	00.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.75
		, 0	0	0.03	V.	00.0	00.00	00.0	00.0	NA	0.44
Measured Froston					4 2	1.07	1.05	1.00	0.92	A N	1.09
							20	0	7.4	Z Z	0.87
Adjusted Char	. 8	0 . 8 /	e .		ć ;				. 0	4 2	- 6-1
Denomenator	1 . 11	1.13	1.07	1.13	Y N	10.1			76.0		
RSRM Liner Thickness	3.807	2.081	1.825	1.827	1.829	1.831	1.832	1.834	1.836	7.4.20	D . C
Margin of Safety	2.43	0.84	0.71	0.62	Y Z	17.0	0.74	0.83	1.00	ď Z	0.55
sealbep 06											
	90	6	6	00	00.0	00.0	00.0	00.0	0.00	00.0	0.15
Measured Froston					60	0.84	0.87	0.85	0.84	0.72	1.63
Measured Char					0 7 0	0.67	0.70	99.0	0.67	0.58	1.30
Adjusted Char		7 0			88	8.0	0.87	0.85	0.84	0.72	1.93
Denomenator	1.0		1 825	1.827	1.829	1.831	1.832	1.834	1.836	2.426	3.048
Margin of Safety	2.56	1.31	0.82	1.01	1.08	1.18	1.11	1.16	1.19	2.37	0.58
180 degrees											
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Margin of Safety	2.56	96.0	69.0	0.74	0.78	0.87	0.83	0.87	1.24	¥ N	۷ 2
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Minimum margin of saf	ety is	0.03 At	station	107.77	safety is 0.03 at station 107.77 degree 255.00	5.00							
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					•								
eeπ .	suredc	har adju	sted to	o pue	Measured char adjusted to end of action time	•							
			minim	um line	minimum liner thickness	en Us	-						
Margi	n of Sa	fety = '	rgin of safety a colonial and a second	1 4	- 10 × 4.00 0 0 + 1 25 X 20 0 00 00 00 00 00 00 00 00 00 00 00 0	di cher	1						
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330 degrees

Heasured Erosion
Heasured Char
Adjusted Char
Denomenator
RSRM Liner Thickness
Margin of Safety

Measured Eroston Measured Char Adjusted Char

345 degrees

\* Measured char adjusted to end of action time

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## **Appendix C Insulation Postfire Data**

# Final Postflight Hardware Evaluation Report RSRM-32 (STS-57)

November 1993

## Prepared for:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GEORGE C. MARSHALL SPACE FLIGHT CENTER MARSHALL SPACE FLIGHT CENTER, ALABAMA 35812

Contract No. NAS8-38100

DR No. 4-23

WBS No. 4C601-04-01

ECS No. SS4775

Thickol CORPORATION SPACE OPERATIONS

P.O. Box 707, Brigham City, Utah 84302-0707 (801) 863-3511



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RSRM-32A IGNITER CHAMBER AND ADAPTER INSULATION PERFORMANCE

	ADAPTER SERIAL NO.	ž.	PART NO. 1U77392-01 SERIAL NO. 0000020	SEKIAL NO. 0000013 PART NO. 1077392-0 SERIAL NO. 0000020	13 -01 20			PRE	FIRI	PREFIRE MEASUREMENTS INCHES	ASUR	EMEN	4T.S					
STATION (NO.)	0.0	9	0.0	06	٥.	DEGREE 150.0		LOCATION 180.0	ON 2,	240.0	270	0.0	330	0.0	MED	MEDIAN	MIM	MINIMUM
1.0 2.0 3.0 4.0 6.0 6.0 7.0 8.0 11.0	0.540	•	. 540		0.540	0.0	. 540	0.540		0.540	0	540	0	.540	•	. 540		0.540
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SEC PAGE C-2.

	PLANE										150.0		
	MINIMUM										3.05		
	330.0										3.23		
S # S	DEGREE LOCATION 90.0 150.0 180.0 240.0 270.0 330.0										3.37		ATION
COMPLIANCE SAFETY FACTORS (CSF)	N 240.0										3.40 3.05 3.50 3.37	RRED	THAT ST
ETY FAC	DEGREE LOCATION 150.0 180.0										3.50	IDD OCC	SLE FOR
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11 M 4 M 0 L 8 9 C										
11.0	4.00	3.97	4.06	3.65	4.19	4.03	4.03	3.86	3.65 150.0	150.0
+ D - H - S	OD TAN	1.0 4.00 5.97 4.00 5.00 4.19 4.	1.15.3.X	2 3. ET 5.	ביין		n	7 7 7	0 0 1	TOO SON TOTAL WIND OF HAMP AND TOO BOOK THE STATE TOO SON THE STATE STATE OF THE ST

ACTUAL SAFETY FACTORS (ASF)

A BLANK INDICATES NO DATA AVAILABLE FOR THAT STATION

DOC NO. TWR-64240 VOL

	MAXIMUM										0.148	
	MEDIAN										0.135	
	DEGREE LOCATION 90.0 150.0 180.0 240.0 270.0 330.0										0.135 0.136 0.133 0.148 0.129 0.134 0.134 0.140	
(MDD)	270.0										0.134	ATION
N DEPTH	N 240.0										0.134	THAT ST
OMPOSITIO (INCHES)	LOCATIO 180.0										0.129	LE FOR
MATERIAL DECOMPOSITION DEPTH (MDD) (INCHES)	DEGREE LOCATION 150.0 180.0										0.148	A BLANK INDICATES NO DATA AVAILABLE FOR THAT STATION
MATERIA											0.133	O DATA
	0.09										0.136	CATES N
	0.0										0.135	K INDI
	STATION (NO.)	1.0	3.0	4.0	5.0	6.0	7.0	<b>8</b> .0	9.0	10.0	11.0	A BLAN

11.0 10.0	0.0 60.0 90.0 150.0 180.0 240.0 270.0 330.0 AVERAGE	150.0	150.0 180.0	240.0	270.0	330.0	AVERAGE
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9.0 0.0							
0.6							
0.6							
11.0 1.1 1.1 1.1 1.2 1.1 1.1				1.1	1.1	1.1	1.1

MATERIAL DECOMPOSITION RATE (MDR) (MLS/SEC)

A MDR=0 INDICATES THAT MDR < .1 MIL/SEC

A BLANK INDICATES NO DATA AVAILABLE FOR THAT STATION

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PERFORMANCE
INSULATION
ADAPTER
AND
CHAMBER
IGNITER
5RM-32B

CHAMBER CHAMBER ADAPTER ADAPTER	PART N SERIAL PART N SERIAL	PART NO. 1U75162-02 SERIAL NO. 0000014 PART NO. 1U77392-01 SERIAL NO. 0000021	5162-02 000014 7392-01		PREFI	PREFIRE MEASUREMENTS INCHES	SUREMEN	SI E		
STATION (NO.)	0.0	0.09	0.06	DEGREE 150.0	LOCATION 180.0	N 240.0	270.0	330.0	MEDIAN	MINIMUM
1.0 2.0 3.0 4.0 5.0 6.0 7.0 9.0	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540	0.540
A BLANK CHAMBER CHAMBER ADAPTER		INDICATES NO DATA W PART NO. N/A SERIAL NO. 0000000 PART NO. 1U77457-01 SERIAL NO. 0000004	DATA W 100000 1457-01	WAS TAKEN	⋖	T THAT STATION POSTFIRE MEASUREMENTS INCHES	ION ASUREME ES	v. E.		
STATION (NO.)	0.0	0.09	0.06	DEGREE 150.0	LOCATION 180.0	240.0	270.0	330.0	MEDIAN	MINIMUM
0.000.000000000000000000000000000000000										
10.0 11.0	0.401	394	0 414	403	900	90%	201	707	•	

COMPLIANCE SAFETY FACTORS (CSF)

270.0 330.0 MINIMUM PLANE	3.03 3.37 3.03 270.0	STATION	270.0 330.0 MINIMUM PLANE	3.62 4.03 3.62 270.0
DEGREE LOCATION 150.0 180.0 240.0	3.28 3.21 3.18	NEGLIGIBLE MDD OCCURRED DATA AVAILABLE FOR THAT S'	ACTUAL SAFETY FACTORS (ASF) DEGREE LOCATION 90.0 150.0 180.0 240.0	3.91 3.83 3.80
DE 60.0 90.0 1	3.10 3.59		ACTUAL SA DE 60.0 90.0 1	4.29
STATION (NO.)	1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0	SF= + INDICATES THAT A BLANK INDICATES NO	STATION (NO.) 0.0 1.0 2.0 3.0 4.0	5.0 6.0 7.0 8.0 9.0 10.0 11.0 3.88 3.70

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SEC PAGE C-6

			MATERI	AL DECOM	OMPOSITI (INCHES)	MATERIAL DECOMPOSITION DEPTH (MDD) (INCHES)	(MDD)			
STATION (NO.)	0.0	60.0		DEGREE LOCATION 150.0 180.0	LOCATI 180.0	DEGREE LOCATION 90.0 150.0 180.0 240.0 270.0 330.0	270.0	330.0	MEDIAN	MAXIMUM
1.0										
2.0										
3.0										
4.0										
5.0										
0.9										
7.0										
8·0										
0.6										
10.0										
11.0	0.139	0.146	0.126	0.138	0.141	0.139 0.146 0.126 0.138 0.141 0.142 0.149 0.134	0.149	0.134	0.140	0.149
A BLAN	K INDI	CATES N	O DATA	AVAILAB	ILE FOR	A BLANK INDICATES NO DATA AVAILABLE FOR THAT STATION	ATION			

			MATERI	AL DECON	MATERIAL DECOMPOSITION RATE (MDR) (MLS/SEC)	N RATE	(MDR)			
STATION (NO.)	0.0	0.09 0.0		DEGREE 150.0	DEGREE LOCATION 150.0 180.0	240.0	270.0	330.0	DEGREE LOCATION 90.0 150.0 180.0 240.0 270.0 330.0 AVERAGE	
1.0										
2.0										
3.0			_							
4.0					-					
5.0										
0.9										
7.0										
0.8										
0.6										

	1.1
	1.2
	1.2
	1.2
	1.1
	1.0
	1.2
	1.1
10.0	11.0

MOTOR ACTION (EXPOSURE) TIME = 122.10 SEC A MDR=0 INDICATES THAT MDR < .1 MIL/SEC

A BLANK INDICATES NO DATA AVAILABLE FOR THAT STATION

DOC NO. TWR-64240 VOL



Tables 3, 4, 5, 6

C-III

RSRM-32A FORWARD CENTER NBR INHBITOR MEASUREME	RSRM-32A	FORWARD	CENTER	NBR	INHBITOR	MEASUREMENTS
--	----------	---------	--------	-----	----------	--------------

DEGREE LOCATION			INCH STA	rion			
	4.2	4.7	10.7	15.7	18.7	23.7	26.6
0	0.764	0.757	0.712	0.572	0.529	0.423	0.418
60	0.890	0.895	0.761	0.723	0.572	0.416	N/A
120	0.863	0.878	0.715	0.634	0.478	0.399	N/A
180	0.869	0.852	0.748	0.695	0.581	0.500	N/A
240	0.863	0.848	0.718	0.616	0.474	N/A	N/A
300	0.899	0.905	0.798	0.648	0.509	0.365	N/A

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION

C-IV

## RSRM-32B FORWARD CENTER NBR INHBITOR MEASUREMENTS

DEGREE	LOCATION			INCH STA	TION			
		4.2	4.7	10.7	15.7	18.7	23.7	26.6
	0	0.920	0.887	0.862	0.697	0.642	0.566	· N/A
6	Ō	0.945	0.952	0.823	0.838	0.660	0.519	N/A
1:	20	0.992	0.997	0.982	0.690	0.582	0.515	N/A
1:	80	0.890	0.887	0.833	0.706	0.734	0.563	N/A
2.	40	0.941	0.960	0.811	0.694	0.612	N/A	N/A
31	00	0.955	0.968	0.802	0.860	0.614	0.445	N/A

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION

C-V

### RSRM-32A AFT CENTER NBR INHBITOR MEASUREMENTS

DEGREE LOCATION		:	INCH STA	TION			
	4.2	4.7	10.7	15.7	18.7	23.7	26.6
0 60 120 180 240	0.696 0.729 0.702 0.709 0.740	0.666 0.718 0.661 0.675 0.707	0.400 0.397 0.415 0.470 0.415	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A	N/A N/A N/A N/A N/A
300	0.702	0.669	N/A	N/A	N/A	N/A	N/A

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION

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#### RSRM-32B AFT CENTER NBR INHBITOR MEASUREMENTS

DEGREE LOCATION		:	INCH STA	rion			
	4.2	4.7	10.7	15.7	18.7	23.7	26.6
0 60	0.762	0.745 0.765	0.418 0.370	N/A N/A	N/A N/A	N/A N/A	N/A N/A
120 180 240	0.803 0.825 0.794	0.770 0.790 0.772	0.499 0.455 0.457	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A
300	0.796	0.792	0.414	N/A	N/A	N/A	. N/A

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION

SEC



Tables 7, 8

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#### RSRM-32A AFT NBR INHBITOR MEASUREMENTS

DEGREE LOCATION		INCH STATIO	ON
	3.9	4.9	
0	0.510	0.369	
60	0.428	0.051	
120	0.430	N/A	
180	0.253	N/A	
270	0.405	N/A	
315	0.413	N/A	

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION

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RSRM-32B AFT NBR INHBITOR MEASUREMENTS

DEGREE LOCATION		INCH STAT	10
	3.9	4.9	
0	N/A	N/A	
60	N/A	N/A	
120	0.513	0.365	
180	N/A	N/A	
270	0.437	N/A	
315	N/A	N/A	

\*NOTE: AN N/A INDICATES INHIBITOR ERODED PAST INCH STATION